AD-A154 485 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
PALMER BROOK DAM MA 0.. (U) CORPS OF ENGINEERS WALTHAM
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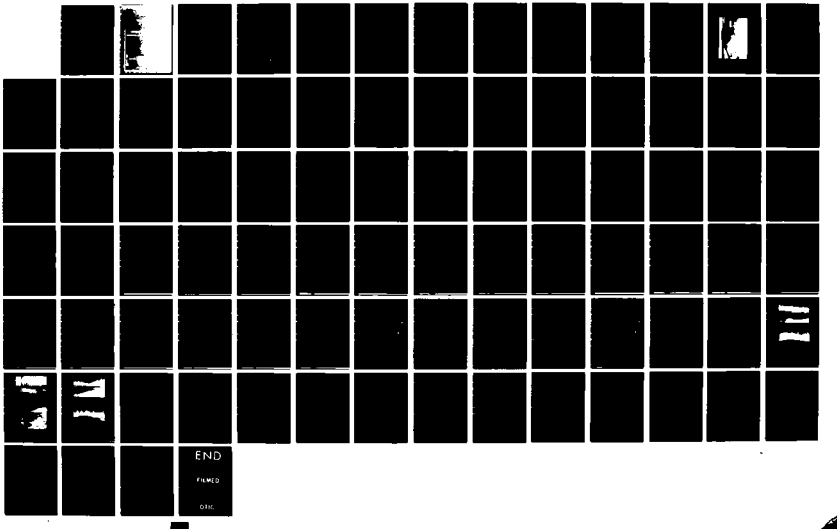

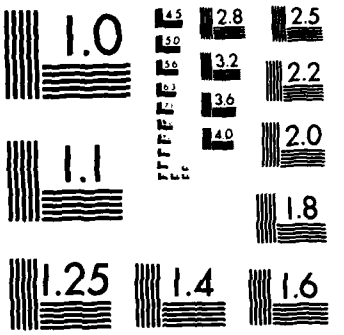

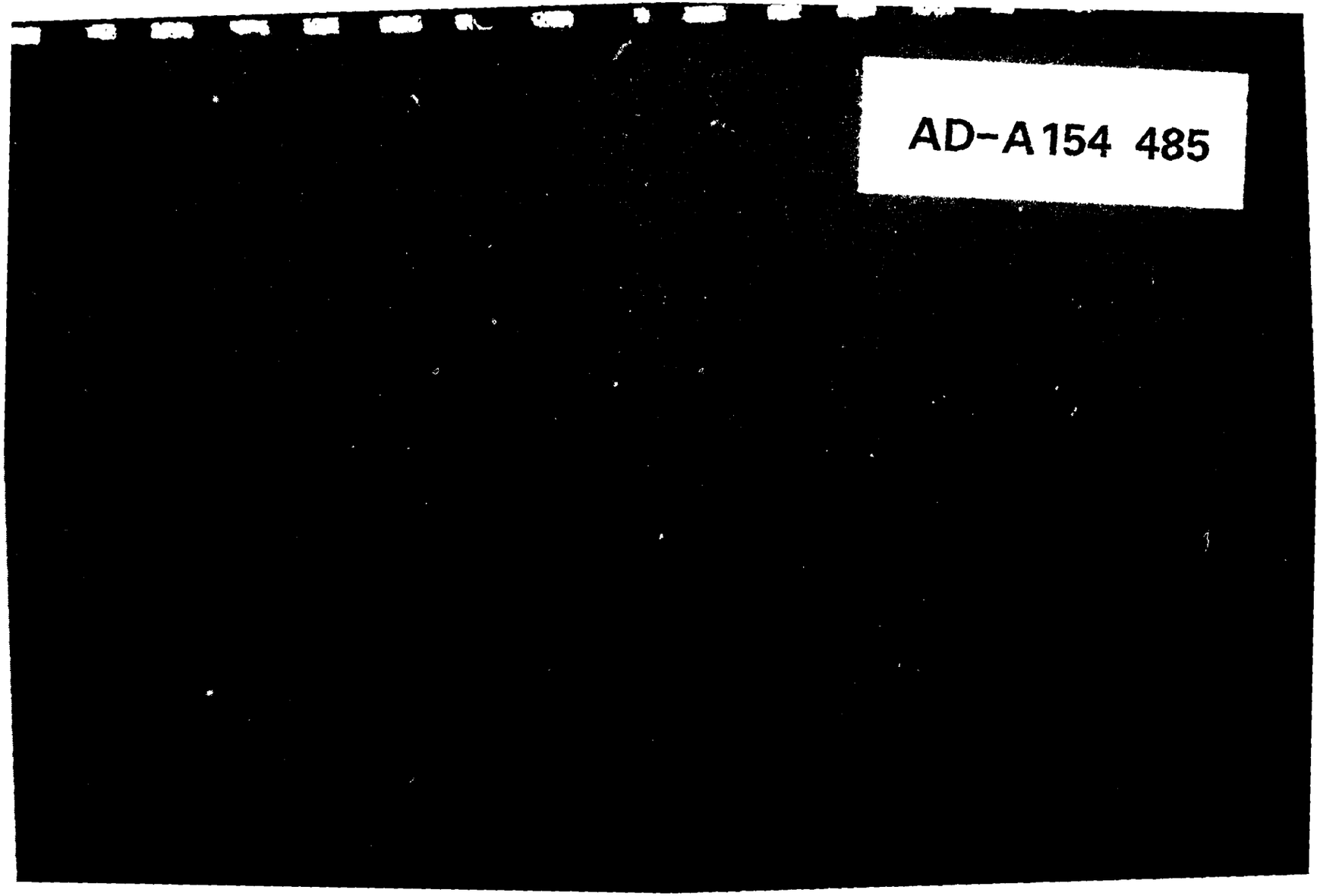
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticur River Basin
Becket, Massachus etts
Palmer Brook

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

Palmer Brook Dam is an earthen embankment structure 33.5 feet high and 290 feet long. Based on visual inspection the dam is judged to be in good condition. It is classified as "intermediate" in size with a "high" hazard potential.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

JUN 15 1981

NEDED

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Palmer Brook Dam (MA-00205) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Palmer Brook Corporation, Westport, CT.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated

"Original contains ... plates: All DTIC ... ions will be in black ... white"

PALMER BROOK DAM
MA 00205

CONNECTICUT RIVER BASIN
BECKET, MA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION

PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

IDENTIFICATION NO:	MA 00205
NAME OF DAM:	Palmer Brook Dam
TOWN:	Becket
COUNTY AND STATE:	Berkshire, Massachusetts
STREAM:	Palmer Brook
DATE OF INSPECTION:	November 12, 1980

Palmer Brook Dam is an earthen embankment structure 33.5 feet high and 290 feet long. It has a principal spillway consisting of a concrete drop inlet and a 48-inch diameter reinforced concrete pipe conduit which passes beneath the dam. It also has an auxiliary spillway, which consists of a grass-lined channel with a crest length of 150 feet. West of the dam, and closing a topographic low, is a 470-foot long, 10-foot high earthen embankment dike. Palmer Brook Dam is used for private recreational purposes.

Based on visual inspection, the dam is judged to be in good condition and appears to be well-maintained.

A few trees growing at the downstream end of the auxiliary spillway channel could retain debris and result in a reduction of the emergency spillway capacity. Some minor wheel tracks on the crest of the dike could be a focus for erosion.

Based on the Recommended Guidelines for Safety Inspection of Dams, prepared by the Corps of Engineers, the dam is classified as "intermediate" in size, with a "high" hazard potential. A test flood equal to the Probable Maximum Flood (PMF) was selected for the analyses performed for this report. The capacity of the auxiliary spillway is approximately 4,520 cfs with the pool level at the top of the dam, which is about 243 percent of the routed test flood outflow of 1,860 cfs. During the test flood, the freeboard for the dam would be 1.9 feet.

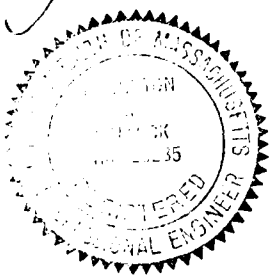
It is recommended that the owner continue with the present well-planned and well-executed program of maintenance and inspection, which utilizes the services of a professional engineer. This program should be augmented by monitoring seepage from the toe drain, by establishing a surveillance program for use during and immediately after heavy rainfall, and by developing a downstream warning plan for use in emergency situations. Vegetation should be established in the wheel tracks on the crest of the dike, and the trees growing at the downstream end of the auxiliary spillway channel should be removed.

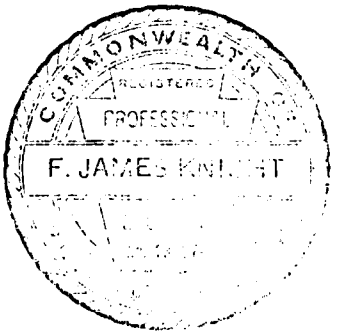
The Owner should implement the remedial measures within one year after receipt of this Phase I Inspection Report.

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

Houghton R. Hallock, P.E.

F. James Knight, P.E.
Assistant Vice President
Project Manager





This Phase I Inspection Report on PALMER BROOK DAM (MA-00205) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railing and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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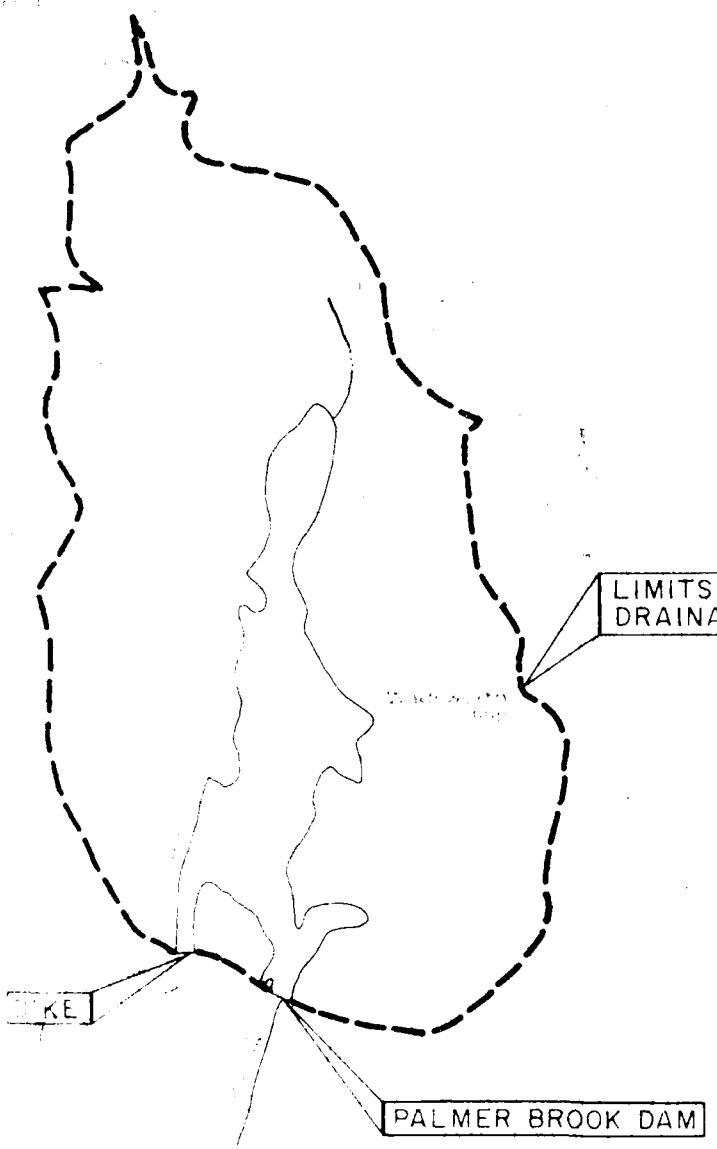
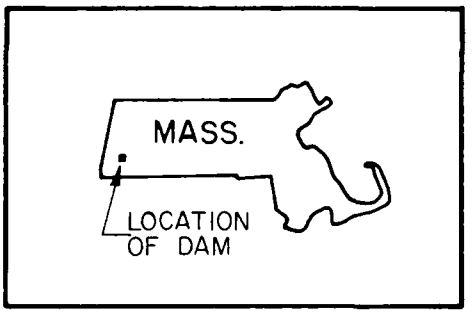
Palmer Brook Dam

Overview

FIGURE 1

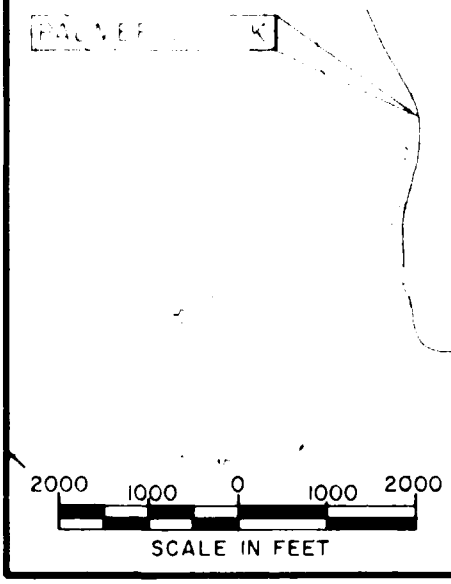




VICINITY MAP

NOTES:

1. DAM SHOWN ON USGS QUADRANGLE BECKET, MASS.
2. DAM LOCATED 3.8 MILES SOUTHWEST OF BECKET, MASS. IN CONNECTICUT RIVER BASIN.



GANNETT FLEMING CORDDRY AND CARPENTER, INC. *CONSULTING ENGINEERS* BOSTON, MASS.	U. S. ARMY ENGINEER DIVISION NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PALMER BROOK DAM

LOCATION MAP AND DRAINAGE AREA

DRAWN	CHECKED	APPROVED	SCALE AS SHOWN	
L.L.R.	D.B.W.	F.J.K.	DATE 2/81	PAGE V

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination indicates that Palmer Brook Dam is in good condition. There are no major concerns with respect to the integrity of the dam. Hydraulic analyses indicate that the auxiliary spillway can discharge 4,520 cfs with the pool level at the top of the dam. The auxiliary spillway capacity is about 243 percent of the routed test flood (PMF) outflow of 1,860 cfs. During the test flood, the freeboard for the dam would be 1.9 feet. If the dam were to fail, there would be severe property damage and probable loss of more than a few lives.

b. Adequacy of Information. The information available from the design drawings and the results of the visual inspection is adequate for the purposes of this Phase I inspection.

c. Urgency. The owner should implement the recommendations in 7.3 within one year after receipt of this Phase I report.

7.2 Recommendations. There are no recommendations for design or construction of changes in the dam and appurtenant structures.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should augment the present well-planned and well-executed program of maintenance and inspection by monitoring seepage from the toe drain, by establishing a surveillance program for use during and immediately after heavy rainfall, and by developing a downstream warning program to follow in case of emergency. The owner should establish vegetation in the wheel tracks on the crest of the dike, and he should remove the trees at the downstream end of the auxiliary spillway channel.

7.4 Alternatives. There are no practical alternatives to the above recommendations.

6.3 Post-Construction Changes. As part of a continuing program of maintenance, experiments are being performed to choose an optimum combination of grass types, fertilizer, and lime application to ensure the development of a good grass cover on the embankment.

6.4 Seismic Stability. This dam is located in the boundary area between Seismic Zones 1 and 2 and, in accordance with the Phase I guidelines, does not warrant seismic analysis.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations. Nothing was observed during the visual inspection that would indicate that there are any major potential problems with the structural stability of the dam. The slopes appear to be stable, there is no evidence of seepage or piping, and the embankment and downstream toe area are well maintained so that they can be adequately inspected. The wheel tracks on the crest of the dike could be a focus for erosion if the dike were overtopped.

6.2 Design and Construction Data. The dam was designed in 1967 by Robert G. Brown & Associates. A complete set of design drawings (10 sheets) has been reviewed as part of this inspection.

The dam and dike are both designed with 3H:1V slopes, both upstream and downstream, and with stone riprap on the upstream slopes within the range of wave action.

The design drawings show that the dam is founded on glacial deposits underlain by bedrock at a depth of about 7 feet.

The design of the dam embankment required that the contractor "selectively place most impervious soil in core trench and in central portion of dam and coarser grained soil toward outer edges." The design called for a cutoff trench 10 feet wide at the bottom, the bottom elevation to be determined by the engineer in the field during construction.

The design also called for a filter trench near the downstream toe, the trench to be 3 feet wide and of variable height, with the bottom elevation to be determined by the engineer in the field during construction. The filter specification called for 100% of the filter material to pass the 3-inch sieve and not more than 5% to pass the No. 200 sieve. An 8-inch asbestos-cement perforated Type I underdrain pipe was specified for draining the filter.

The only difference between the design and what was observed during the visual inspection is that the pipes which drain the toe filter are corrugated-metal pipe rather than asbestos-cement pipe.

The only construction data that were reviewed consist of notations on the design drawings that indicate minor differences between design and as-built details. No data are available concerning the embankment materials and their placement conditions.

5.4 Test Flood Analysis. Palmer Brook Dam is in the "intermediate" size category and in the "high" hazard category. In accordance with Corps of Engineers' guidelines, a spillway design flood equal to the Probable Maximum Flood (PMF) should be used to evaluate the spillway. In the following analysis, the PMF was used as the test flood. The test flood (PMF) inflow of 3,280 cfs is based on a watershed area of 1.54 square miles in rolling terrain. The test flood was routed through Palmer Brook reservoir. Routing was started with the pool level at the principal spillway crest level. For the purpose of this report, the discharge capacity of the principal spillway was not included. Using only the capacity of the auxiliary spillway, the routed test flood outflow was determined in accordance with Corps of Engineer Guidance for Estimating Effect of Surcharge Storage on Maximum Probable Discharges. The routed test flood outflow was determined to be 1,860 cfs. The maximum capacity of the auxiliary spillway is about 4,520 cfs, which is approximately 243 percent of the routed test flood outflow. The test flood would result in a maximum pool elevation of 1716.6. Since the top of the dam is at Elevation 1718.5, the remaining freeboard for the dam would be 1.9 feet.

5.5 Dam Failure Analysis. The impact of failure of the dam was assessed using the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs prepared by the Corps of Engineers. The breach discharge was estimated with the water surface at the test flood pool level and a breach width equal to 40 percent of the mid-height length of the dam. The maximum breach discharge was determined to be 19,780 cfs. That discharge was routed downstream using one stream section that was considered typical of the first 1.5-mile reach. The flow was then routed through the swampy area and through Ward Pond. In routing the flow through this reach, the railroad embankment at the outlet at Ward Pond was treated as if it were a dam. A detailed discussion of the results is included in Appendix D. In summary, it was found that dam failure would cause flooding of many cottages along the shoreline of Ward Pond, and that there would probably be loss of more than a few lives. For this reason, Palmer Brook Dam has been placed in the "high" hazard category. The probable flood impact area is shown on Exhibit D-1 in Appendix D.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General. Palmer Brook Dam has a drainage area of 1.54 square miles. The watershed area has rolling terrain, is mostly wooded, and mostly undeveloped. There are no impoundments upstream from Palmer Brook Dam.

The dam is an earthfill structure with a maximum height of 33.5 feet and a length of 290 feet. In addition to the main embankment, there is also a dike located about 1,200 feet to the west. The dike is 10.5 feet high and 470 feet long. Both the top of the dam and the dike are at Elevation 1718.5.

There is a principal spillway and an auxiliary spillway at the dam. The principal spillway is located at the highest section of the dam and consists of a rectangular riser section and a 48-inch diameter outlet conduit. The riser section has two crest segments, each of which is 12 feet long and at Elevation 1712.0. Normal pool level is controlled by the crest level of the principal spillway. The auxiliary spillway is a grassed, trapezoidal channel located at the right abutment of the dam. The control section is at Elevation 1714.0 and is 150 feet long. The auxiliary spillway has an excavated approach channel and an excavated outlet channel.

In addition to the previously described features, there are also outlet works facilities at the principal spillway that can be used to drawdown the reservoir. A 36-inch diameter conduit leads from the upstream toe of the dam to the riser section. A slide gate is located in the riser section at the end of the drawdown conduit.

The hydrologic and hydraulic computations performed for this report are included in Appendix D. For the purposes of this study, the discharge capacity of the principal spillway was not included in the analysis because the trash racks on the principal spillway could become clogged with debris during a flood.

5.2 Design Data. No hydrologic or hydraulic design computations were available for review. However, review of the design drawings and the results of computations performed for this report indicate that the spillways were designed in accordance with Soil Conservation Service criteria for a Class "C" structure, which essentially corresponds to the "high" hazard classification as used in this report.

5.3 Experience Data. There are no records of the maximum discharge at the site.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures.

a. General. The dam is self-regulating and, as such, does not require operation. Personnel employed by the Palmer Brook Corporation reportedly visit the dam regularly. Observations during these visits normally include assessments of maintenance and condition, and remedial actions are taken as required. In addition, professional engineers employed by the owner visit the dam and inspect it twice a year.

b. Description of any Warning System in Effect. No formal warning system is in effect.

4.2 Maintenance Procedures.

a. General. As part of the regular visits by professional engineers mentioned above, recommendations are made concerning maintenance requirements. As evidenced by the good condition of the project at the time of this inspection, this procedure seems to be completely adequate.

b. Operating Facilities. The only mechanically operable facility is the 36-inch diameter slide gate. This facility has reportedly been serviced by representatives of the manufacturer, the Rodney Hunt Co., and appears to be in good condition.

4.3 Evaluation. Maintenance of this dam appears to be excellent. The condition of all features, and the level of active involvement by the design engineering firm, is outstanding for a privately owned facility. The procedures are adequate and require no changes.

There are a few trees growing at the downstream end of the spillway where it discharges over the natural bank of the downstream channel.

There is a dike located approximately one-quarter mile west of the dam (Photo No. 6). The upstream slope (down to the top of the riprap), the crest, the downstream slope, and a zone about 50 feet wide at the downstream toe are sparsely covered with grass and weeds which have been kept mowed. On the crest there are two wheel tracks that are essentially bare of vegetation. The riprap on the upstream slope extends from an elevation a few feet above the normal pool level to some elevation (which could not be determined from the visual inspection) below the pond level. Some areas near the downstream toe appear to be soft and wet, but it appears that this condition is due to a naturally high groundwater table in the flat area downstream of the dike. There was no evidence of active seepage in the downstream toe area. There are no outlet facilities at the dike.

c. Reservoir Area. The area adjacent to Palmer Brook reservoir generally has moderate slopes and is entirely wooded. There are no impoundments located upstream from Palmer Brook Dam.

d. Downstream Channel. The channel downstream from Palmer Brook Dam has a relatively uniform cross-section for the first 1.5 miles. In this reach both the channel slope and the side slopes are moderate. The entire reach is wooded. One dwelling, situated about 10 feet above the streambed, is located 1.4 miles downstream from the dam. At the end of the first reach, Palmer Brook goes under a roadway and the valley becomes much broader and much flatter. Over the next 0.8 mile reach, there are swampy areas and two small natural ponds. One of the ponds, Ward Pond, is located at the downstream end of the reach. There is an abandoned railroad embankment at the outlet of Ward Pond. The embankment is about 35 feet high and has two box culverts through it. Each culvert is 5 feet wide and 6.3 feet high, and the culverts act as controls for pool levels at Ward Pond during periods of higher than normal discharge. The primary potential damage center is located along the shoreline of Ward Pond, where there are many cottages situated from 5 feet to 20 feet above the normal pool level. Most of the cottages are in use throughout the year. Immediately downstream from the railroad embankment is an embankment for the Massachusetts Turnpike. That embankment has a single box culvert 16 feet wide by 7 feet high.

3.2 Evaluation. On the basis of the visual inspection, the dam is judged to be in good condition and appears to be well-maintained. A few trees growing at the downstream end of the emergency spillway could retain debris and result in a reduction of the emergency spillway capacity when it discharges water. The wheel tracks on the crest of the dike (Photo No. 6) could be a focus for erosion if the dike were overtopped.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. Dam. The upstream slope (down to the top of the riprap), the crest, and the downstream slope of the embankment are covered with grass which has been mowed. The appearance of the embankment indicates that it is well maintained and in good condition (Photo Nos. 1,2, and 4). There is a boulder-riprap on the upstream slope from approximately the elevation of the top of the drop-inlet structure to some elevation (which could not be determined from the visual inspection) below the pond level (Photo No. 2).

Both abutments of the dam consist of soil, and the contacts between the embankment and the abutments are in good condition (Photo Nos. 2 and 5).

Two 8-inch CMP pipes discharge at the downstream toe of the embankment adjacent to the principal spillway outlet conduit. The two 8-inch pipes appear to be toe drains. Both have guards to prevent animals from entering. The pipe on the right side of the outlet conduit was discharging approximately 1 gpm of clear water; the pipe on the left side was not discharging any water.

No evidence of seepage on the downstream slope or in the downstream toe area was observed.

b. Appurtenant Structures. The principal spillway is located at the highest section of the dam and consists of a rectangular, concrete riser section and a 48-inch diameter, concrete outlet conduit. The riser section has two overflow crest segments, each 12 feet long, that control normal pool level. A trashrack is located atop the riser section (Photo No. 3). A stilling pool is located in the channel at the downstream end of the conduit (Photo No. 4). In addition to the features described above, there is also a 36-inch diameter, concrete conduit that leads from the upstream toe of the dam to the riser section of the principal spillway. The 36-inch diameter conduit has a slide gate located at the riser section, and it can be used to draw down the reservoir. No deficiencies were observed for any of the features that were visible. All concrete at the riser section is in good condition, metal items are painted, riprap in the stilling pool is intact, and the 48-inch outlet conduit is in good condition.

The auxiliary spillway is a grass-covered channel cut in natural soil at the right abutment (Photo No. 5). The grass has been mowed and the spillway is well-maintained.

SECTION 2

ENGINEERING DATA

2.1 Design Data. Engineering data, design drawings and complete records exist and are in the possession of Robert G. Brown and Associates. The data are complete and detailed and too extensive to be included totally as part of this report.

2.2 Construction Data. Complete construction records exist and are in the possession of Robert G. Brown and Associates.

2.3 Operation Data. Complete operation, maintenance and regular inspection records exist and are in possession of Robert G. Brown and Associates, and the owner.

2.4 Evaluation of Data.

a. Availability. Data are in good order and are readily available.

b. Adequacy. Data are judged to be adequate.

c. Validity. Based on the limited review conducted as part of this inspection, the data appears to be valid.

g. Dam and Dike. (Cont'd.)

	Dam	Dike
(6) Zoning	pervious shells, impervious cores limits not designated	
(7) Cutoff	12-foot wide trench	10-foot wide trench
(8) Grout curtain	none	none

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway

	Principal Spillway	Auxiliary Spillway
(1) Type	Riser section and 48-inch diameter conduit	Trapezoidal channel with control section
(2) Length of weir	2 @ 12-feet each	150 feet
(3) Crest elevation	1712.0	1714.0
(4) Gates	none	none
(5) Upstream channel	reservoir	excavated approach channel
(6) Downstream channel	natural streambed	excavated outlet channel

j. Regulating Outlets.

(1) Invert - Elevation 1692.5
(2) Size - 36-inch diameter.
(3) Description - reinforced concrete pipe leading from upstream toe of dam to principal spillway riser section.
(4) Control mechanism - slide gate located at riser section.

dam was completed is unknown. Hydraulic calculations indicate that the auxiliary spillway can discharge about 4,520 cfs when the pool level is at the top of the dam. The auxiliary spillway can pass the test flood (PMF) with about 1.9 feet of freeboard remaining, even without consideration of outflow through the principal spillway.

c. Elevation (feet above NGVD).

(1) Streambed at toe of dam - 1685.0
(2) Bottom of cutoff - 1685.0
(3) Maximum tailwater - 1691.5
(4) Normal pool (principal spillway crest) - 1712.0
(5) Full flood control pool - not applicable.
(6) Auxiliary spillway crest - 1714.0
(7) Design surcharge (original design) - unknown.
(8) Top of dam - 1718.5
(9) Top of dike - 1718.5
(10) Test flood surcharge - 1716.6

d. Reservoir (length in feet)

(1) Normal pool - 6,600
(2) Flood control pool - not applicable.
(3) Spillway crest pool - 6,600
(4) Top of dam - 6,750
(5) Test flood pool - 6,700

e. Storage (acre-feet).

(1) Normal pool (principal spillway crest) - 1,492
(2) Flood control pool - not applicable.
(3) Auxiliary spillway crest pool - 1,772
(4) Top of dam - 2,483
(5) Test flood pool - 2,180

f. Reservoir Surface (acres).

(1) Normal pool (principal spillway crest) - 134
(2) Flood control pool - not applicable.
(3) Auxiliary spillway crest - 146
(4) Test flood pool - 160
(5) Top of dam - 170

g. Dam and Dike.

		Dam	Dike
(1)	Type	earthfill	earthfill
(2)	Length	290 feet	470 feet
(3)	Height	33.5 feet	10.5 feet
(4)	Top width	12 feet	12 feet
(5)	Side slopes	1V on 3H	1V on 3H

at Ward Pond. It is estimated that failure of Palmer Brook Dam could produce pool levels at Ward Pond that would exceed normal levels by as much as 20 feet. There would be probable loss of more than a few lives if the dam were to fail. Accordingly, the dam has been placed in the "high" hazard category.

e. Ownership. The dam is owned by the Palmer Brook Corporation. Mr. David Strassler, President, (413-528-3225) granted permission to enter the property and inspect the dam.

f. Operator. The dam is operated by the Palmer Brook Corporation, P.O. Box 589, Westport, Connecticut 06880.

g. Purpose of Dam. Palmer Brook Dam is used for private recreational purposes.

h. Design and Construction History. Palmer Brook Dam was designed by the engineering firm of Robert G. Brown and Associates, Monterey, Massachusetts. Design criteria and procedures of the U.S. Department of Agriculture, Soil Conservation Service, were employed. The dam was constructed in 1968.

i. Normal Operational Procedures. There are no formal operating procedures. Pool level is normally maintained at the principal spillway crest level, but the dam has reportedly been drawn down occasionally in the past for the purpose of reoxygenating the reservoir and stimulating fish growth.

1.3 Pertinent Data.

a. Drainage Area. The drainage area for Palmer Brook Dam is 1.54 square miles. The terrain varies from moderately steep to steep and can be described as rolling. The watershed is almost entirely wooded. There are no other impoundments upstream from Palmer Brook Dam.

b. Discharge at the Dam. The principal spillway at the dam consists of a riser section and a 48-inch diameter outlet conduit (Photo Nos. 3 & 4). Normal pool level is regulated by the riser, which has a crest elevation of 1712.0, and normal flow at the site is discharged through the principal spillway. The principal spillway also has a gate and a 36-inch diameter low level conduit that can be used as drawdown facilities. There is also an auxiliary spillway located at the right abutment of the dam (Photo No. 5). The auxiliary spillway is a grassed, trapezoidal channel having a bottom width of 150 feet. It is an excavated channel in undisturbed earth. The crest level of the auxiliary spillway is 2 feet above the crest level of the principal spillway. Flows have not been recorded at the site, so the maximum flood discharge since the

at the same elevation. Both have topwidths of 12 feet and 1 vertical on 3 horizontal side slopes. Details of the dam and dike are shown on the Plates in Appendix B, on the Overview Photograph, and on the Photographs in Appendix C.

The dam has a principal spillway and an auxiliary spillway. The principal spillway, located at the highest section of the dam, consists of a rectangular, concrete riser section and a 48-inch diameter outlet conduit (Photo Nos. 3 and 4). The riser section has two overflow crest segments, each of which is 12 feet long. A trashrack is located atop the riser section. Normal to moderate flows are discharged through the principal spillway and into a stilling pool at the downstream toe of the dam.

The normal pool level is controlled by the crest elevation on the principal spillway, but there are also drawdown facilities located at the riser structure. A 36-inch diameter concrete pipe leads from the upstream toe of the dam to the bottom of the riser. There is a slide gate in the riser structure at the downstream end of the drawdown conduit. The operating mechanism is located atop the riser (Photo No. 3).

c. Size Classification. Size classification is determined in accordance with Corps of Engineer guidelines and is based on either height or storage capacity, whichever gives the larger size category. Palmer Brook Dam has a maximum height of 33.5 feet and a maximum storage capacity of 2,483 acre-feet. By virtue of the storage capacity, Palmer Brook Dam meets the requirements for an "intermediate" size dam.

d. Hazard Classification. The valley downstream from the dam is moderately steep and is wooded. One dwelling, situated about 10 feet above the streambed, is located about 1.4 miles downstream. About 1.5 miles downstream from the dam, Palmer Brook goes under a roadway and the valley changes character. For the next 0.8 mile, the valley is broad and flat. Swampy areas are present and there are small natural ponds at both ends of the reach. The pond at the downstream end of the reach is known as Ward Pond. There is an abandoned railroad embankment at the outlet of Ward Pond. The embankment is approximately 35 feet high and has two box culverts through it. Each box culvert is 5 feet wide and 6.3 feet high. The culverts act as flow controls for Ward Pond. The primary potential damage center is along the shoreline of Ward Pond, where there are many cottages situated between 5 feet and 20 feet above normal pool level. Most of the cottages are in use throughout the year. Failure of Palmer Brook Dam would result in flooding of the dwelling located 1.4 miles from the dam and flooding of many cottages

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
PALMER BROOK DAM

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. Public Law 92-367, dated August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility for supervising the inspection of dams within the New England Region. Gannett Fleming Corddry and Carpenter, Inc., has been retained by the New England Division to inspect and report on selected dams in the States of Vermont and Massachusetts. Contract No. DACW33-81-C-0013 dated November 5, 1980, has been assigned by the Corps of Engineers for this work.

b. Purpose. The purpose of the inspection and evaluation of non-Federal dams is to accomplish the following:

(1) Identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the states to quickly initiate effective dam safety programs for non-Federal dams.

(3) Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project.

a. Location. The dam is located on Palmer Brook within the Town of Becket, Massachusetts. Palmer Brook is a tributary to the West Branch Farmington River, which drains to the Connecticut River. The dam is shown on USGS Quadrangle, Becket, Massachusetts, at latitude N 42° 16' 45" and longitude W 73° 06' 30". The location is shown on Figure 1 on page v.

b. Description of Dam and Appurtenances. Palmer Brook Dam is an earthen embankment structure. The dam is 290 feet long and has a maximum height of 33.5 feet. In addition to the dam embankment, there is also an earthen dike located about 1,200 feet to the west. The dike is 10.5 feet high and 470 feet long. The top of the dam and the top of the dike are

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Palmer Brook Dam
MA00205

DATE Nov. 12, 1980

TIME am

WEATHER cloudy, cold

W.S. ELEV. 1712.1 U.S. 1687 DN.S.

PARTY:

1. F. James Knight (GFCC)
2. Ronald Hirschfeld (GEI)
3. Dennis Mehue (BAI)
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Geotechnical	Hirschfeld	
2.	Physical/Hydrology	Knight	
3.	Dimensional	Mehue	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Embankment NAME Hirschfeld

DISCIPLINE Geotech/Physical NAME Knight

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Good. Elevation 1718.5.
Current Pool Elevation	Elevation 1712.1.
Maximum Impoundment to Date	Unknown.
Surface Cracks	None observed.
Pavement Condition	Not paved.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Good.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	No evidence observed.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Riprap in good condition.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	Two 8-inch pipes with animal guards.
Instrumentation System	None observed.
Vegetation	Grass, well-maintained and mowed.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Dike NAME Hirschfeld

DISCIPLINE Geotechnical/Physical NAME Knight

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	
Crest Elevation	Good. Elevation 1718.5.
Current Pool Elevation	Elevation 1712.1.
Maximum Impoundment to Date	Unknown.
Surface Cracks	None observed.
Pavement Condition	Not paved.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Good.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	Not applicable.
Trespassing on Slopes	None observed. Wheel tracks on crest.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	Riprap in good condition.
Unusual Movement or Cracking at or Near Toes	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	None observed.
Vegetation	Grass, well-maintained and mowed.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Control tower NAME Knight

DISCIPLINE Physical NAME

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	Part of service spillway.
General Condition	Good.
Condition of Joints	Good.
Spalling	None observed.
Visible Reinforcing	None observed.
Rusting or Staining of Concrete	None observed.
Any Seepage or Efflorescence	None observed.
Joint Alignment	Good.
Unusual Seepage or Leaks in Gate Chamber	Not inspected. Below pool.
Cracks	None observed.
Rusting or Corrosion of Steel	None observed.
b. Mechanical and Electrical	Not applicable.
Air Vents	Not applicable.
Float Wells	Not applicable.
Crane Hoist	Not applicable.
Elevator	Not applicable.
Hydraulic System	Not applicable.
Service Gates	Not applicable.
Emergency Gates	Slide gate not inspected. Below pool. Operator in good condition.
Lightning Protection System	Not applicable.
Emergency Power System	Not applicable.
Wiring and Lighting System	Not applicable.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Outlet Works NAME Hirschfeld

DISCIPLINE Geotechnical/Physical NAME Knight

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Good.
Bottom Conditions	Not inspected. Below pool.
Rock Slides or Falls	None observed.
Log Boom	None.
Debris	None observed.
Condition of Concrete Lining	Not lined.
Drains or Weep Holes	Not applicable.
b. Intake Structure	
Condition of Concrete	Good.
Stop Logs and Slots	Good to extent visible.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Transition & Conduit NAME Knight

DISCIPLINE Physical NAME

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	Only outlet end visible.
General Condition of Concrete	Good.
Rust or Staining on Concrete	None observed.
Spalling	None observed.
Erosion or Cavitation	None observed.
Cracking	None observed.
Alignment of Monoliths	Good.
Alignment of Joints	Good.
Numbering of Monoliths	Unknown.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Outlet Structure & Channel NAME Hirschfeld

DISCIPLINE Geotechnical/Physical NAME Knight

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good.
Rust or Staining	None observed.
Spalling	None observed.
Erosion or Cavitation	None observed.
Visible Reinforcing	None observed.
Any Seepage or Efflorescence	None observed.
Condition at Joints	Good.
Drain Holes	Not applicable.
Channel	
Loose Rock or Trees Overhanging Channel	None.
Condition of Discharge Channel	Good.

PERIODIC INSPECTION CHECKLIST

PROJECT Palmer Brook Dam DATE Nov. 12, 1980

PROJECT FEATURE Emergency Spillway NAME Hirschfeld

DISCIPLINE Geotechnical/Physical NAME Knight

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Approach Channel	Good to extent visible.
b. Weir and Training Walls	
General Condition of Concrete	Not applicable.
Rust or Staining	Not applicable.
Spalling	Not applicable.
Any Visible Reinforcing	Not applicable.
Any Seepage or Efflorescence	Not applicable.
Drain Holes	Not applicable.
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None.
Floor of Channel	Riprap lined stilling basin covered with boulders, gravel, and sand.
Other Obstructions	Small trees between spillway outlet and stream.
Other Comments	None.

APPENDIX B

ENGINEERING DATA

ROBERT G. BROWN & ASSOCIATES, INC.

Consulting Engineers, Civil-Sanitary

Land Surveyors, Edmund D. Somes, R.L.S.

PLEASANT ST.-RT. 102
LEE, MASS. 01238
TEL. 413-243-2050

BRANCH OFFICE
WORCESTER
TEL. 617-853-1333

June 6, 1973

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS

RECEIVED JUN 8 1973

Referred To J. Piaseczny
Report back to
File

Mr. David Strassler
Treasurer
Palmer Brook Corporation
21 Bridge Street
Westport, Connecticut 06880

Dear Dave:

RE: DPW Inspection Dam #1-2-22-7
Becket
Palmer Brook Corporation - E-3

On June 1, 1973 I inspected the dike and dam and in particular, the seepage noted near the west end of the dike.

Brief thundershowers had occurred just prior to my arrival and just after my departure.

There is a wet spot near the west toe of the dike about 100 square feet in area. The topography is very flat here and the surface runoff puddles in this depression. There was no evidence of fine soil particles being carried or deposited.

There is a similar wet depression on the east end of the dike but the drainage area is larger and some small flow was observed running into and out of the depression. Again, no soil particles were observed being carried or deposited and it appears to be only surface water, not ground water, as the source of the wetness.

On the west toe of the dam where it meets the abutment I observed some water movement not caused by the recent rain. In past years this area has remained damp all year and there are small bare patches where the vegetation is not established because of frequent drownings. Although this is an established situation, and in my opinion not hazardous, I recommend we intercept this ground water with an asbestos-cement perforated underdrain surrounded with a gravel filter of the same gradation as in the designed foundation drain. We would lead the effluent to the stilling basin above water so we could see any possible removal of fines. The work can probably be done for a few hundred dollars and if you wish I will proceed with the work.

Some water was running down the east gutter at the dam which I attribute mostly to surface runoff and a small amount to ground water seepage which is normal to this particular slope.

There are some small repairs to the lower Grist Mill Road access gate which we will attend to this summer.

This year in addition to mowing, we recommend the application of 300 pounds per acre of 10-10-10 fertilizer to encourage a healthier sod. Next year 300 pounds per acre of 10-10-10 fertilizer should again be applied to help establish the sod.

The paint applied to the top of the riser is all peeling off except over metal surfaces. When it becomes looser we can remove it and try again. I can't tell if the paint was defective, not applied correctly, or was not intended for that purpose.

The trash racks were clean, the right drain was running about 1/2 quart per minute (est.) and there was none from the left drain as usual. The floating island was about twice as large as it appeared earlier this spring. There was no evidence of vandalism but there were several beer cans thrown on the ground at the downstream side of the dam and emergency spillway.

We will continue to monitor the seepage areas for any changes or new developments.

Yours truly,

ROBERT G. BROWN & ASSOCIATES, INC.

Robert G. Brown

Robert G. Brown, P. E.

RGB:psw

cc: ✓Fred C. Schwelm, Waterways
Robert Jordan, Lenox
Bob Strassler

L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town BECKET Dam No. 1-2-22-7

Name of Dam Palmer Brook Inspected by RDJordan - RSpaniol

Date of Inspection October 20.1977

Previous Inspection October 27, 1975

2. Owner/s per: Assessors _____
Reg.of Deeds _____ Personal Contact _____

1. Palmer Brook Corp. Westport, Conn _____
Name St. & No. City/Town/State Tel. No.

2. _____
Name St. & No. City/Town /State Tel No.

3. Caretaker (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

_____ _____
Name St.& No. City/Town /State Tel.No.

4. No. of Pictures taken 2

5. Degree of Hazard: (If dam should fail completely)*

1. Minor X 2 Moderate _____

3. Severe _____ 4. Disastrous _____

*This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual X

Operative X Yes _____ No _____

Comments: _____

_____

7. Upstream Face of Dam:

Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

_____

_____

L-168-A

DAM NO. 1-2-22-7

8. Downstream Face of Dam:

Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

9. Emergency Spillway

Condition: 1. Good X 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: _____

_____

10. Water level at time of inspection 0.2' above X below _____

top of dam _____

principal spillway X

other _____

11. Summary of Deficiencies Noted:

NONE Growth (Trees & Brush) on Embankment _____

" Animal Burrows and Washouts _____

" Damage to slopes or top of dam _____

" Cracked or damaged masonry _____

" Evidence of seepage _____

" Evidence of piping _____

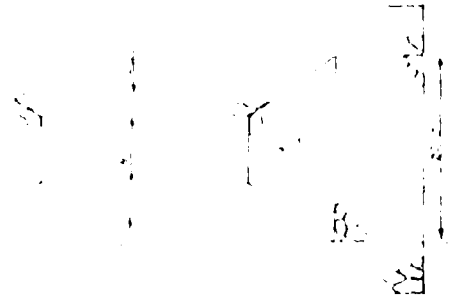
" Erosion _____

" Leaks _____

" Trash and/or debris impeding flow _____

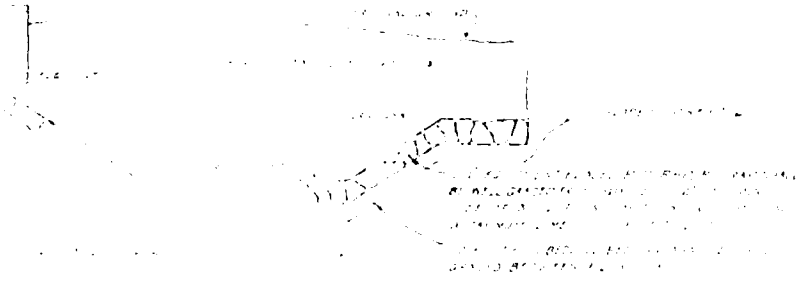
" Clogged or blocked spillway _____

" Other _____

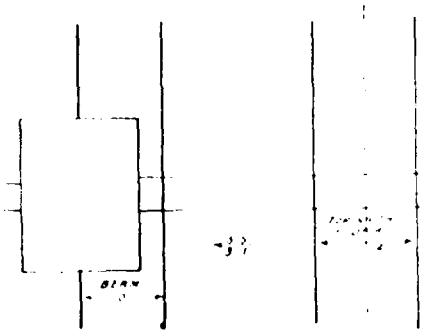


COLLAR NO.	DISTANCE FROM DOWNSTREAM FACE OF RISER	INVERT ELEVATION 48" PIPE
I	12.33	109.5
II	18.33	109.5
III	33.33	109.5
IV	60.33	109.5
V	280	109.5

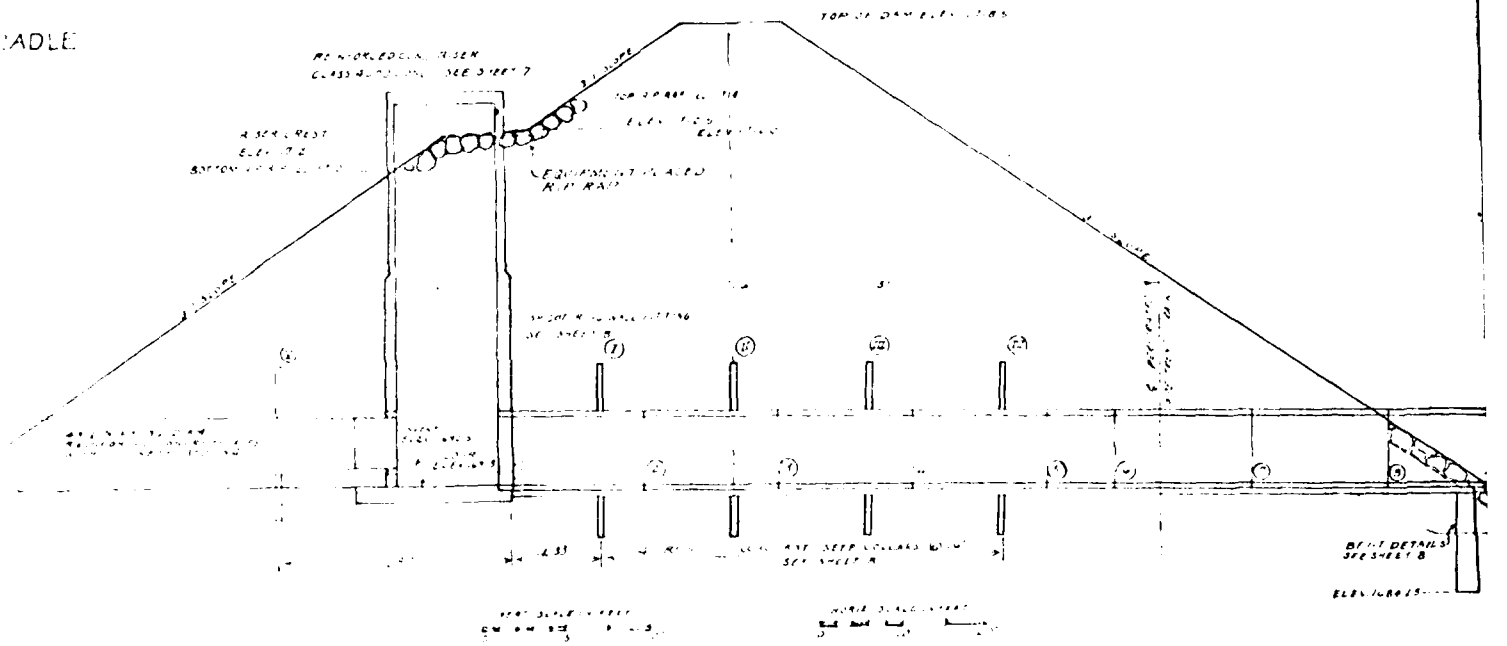
COUPLING NO.	DISTANCE FROM DOWNSTREAM FACE OF RISER	INVERT ELEVATION 48" PIPE
1	0.33	109.5
2	6.33	109.5
3	12.33	109.5
4	18.33	109.5
5	24.33	109.5
6	124.33	109.5
7	224.33	109.5
8	324.33	109.5
ANCHOR	340.33	109.5



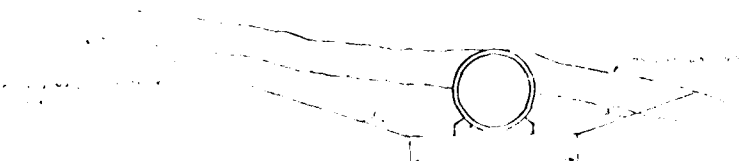
GANNETT FLEMING CORDRY AND CARPENTER, INC. CONSULTING ENGINEERS BOSTON, MASS.		U S ARMY ENGINEER DIVISION NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS PALMER BROOK DAM			
PRINCIPAL SPILLWAY			
DRAWN GCR	DESIGNED DEW	TRACED	SCALE AS SHOWN DATE 2-65
		CHECKED EJK	SHEET NO. 4



PLAN VIEW



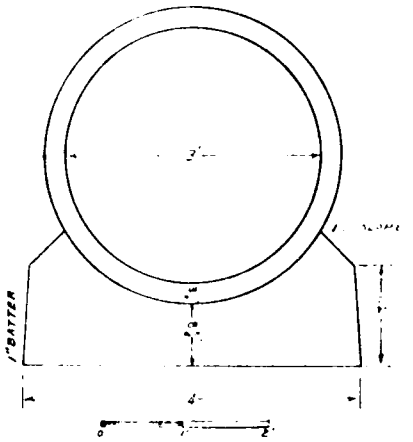
PROFILE ALONG ℄ PRINCIPAL SPILLWAY



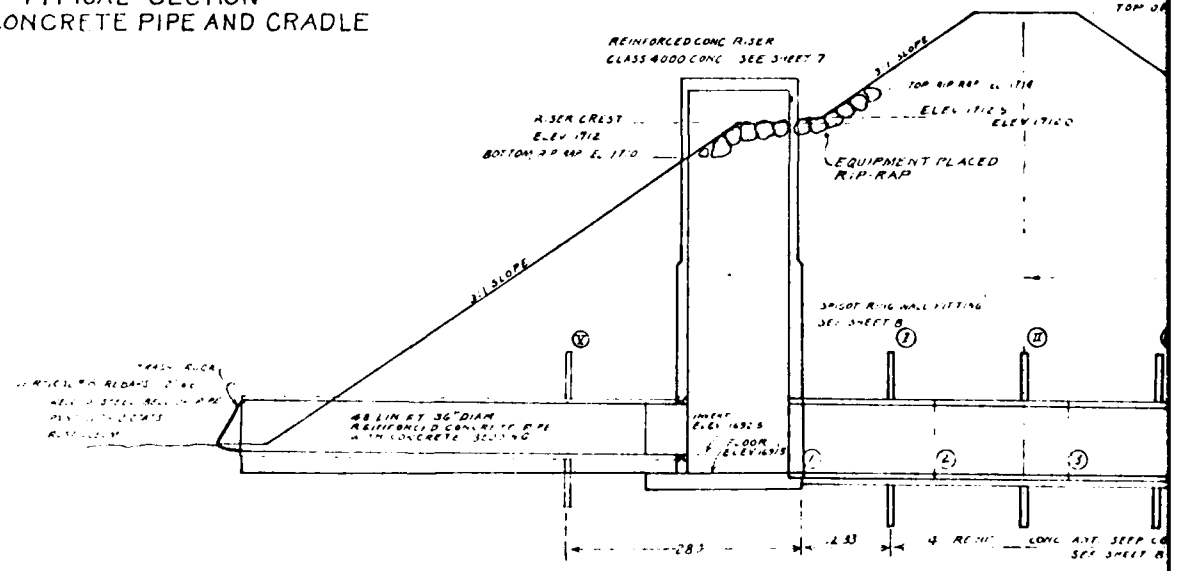
TYPICAL SECTION - PRIN SPWY EXCAVATION

2

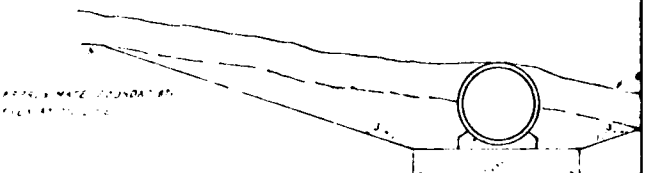
PLAN VIEW



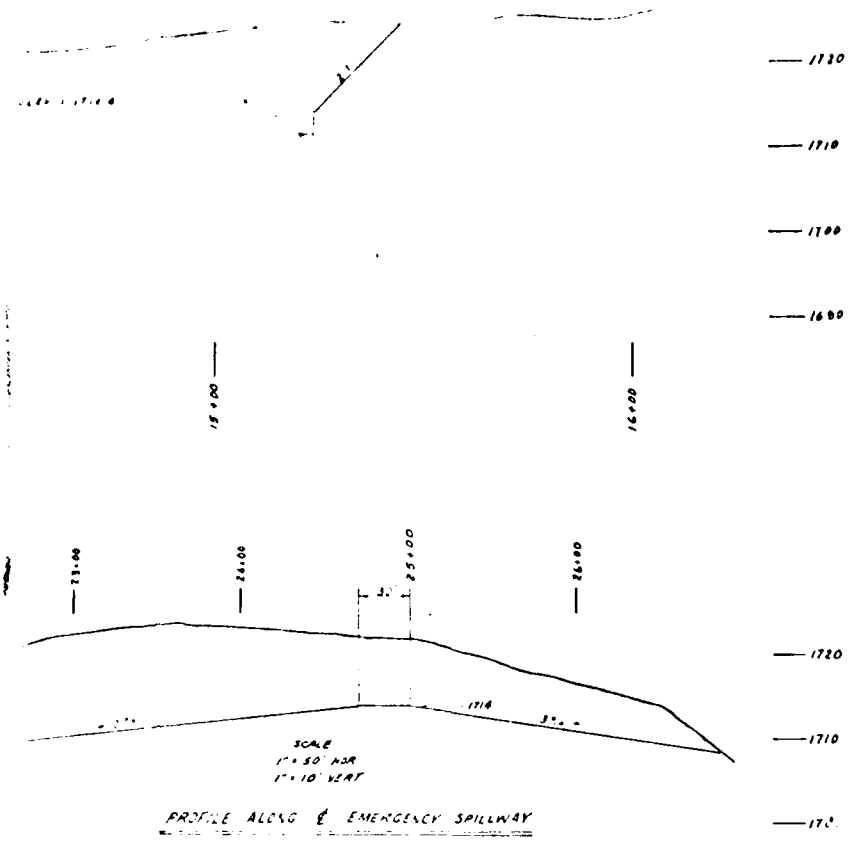
TYPICAL SECTION
36" CONCRETE PIPE AND CRADLE



PROFILE ALONG ℄ PRINCIPAL



TYPICAL SECTION - PRIN SPWY EXCAVATI



PROFILE ALONG ℄ EMERGENCY SPILLWAY

GANNETT FLEMING CORDDRY AND CARPENTER, INC *CONSULTING ENGINEERS* BOSTON, MASS	U S ARMY ENGINEER DIVISION NEW ENGLAND *CORPS OF ENGINEERS* WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PALMER BROOK DAM

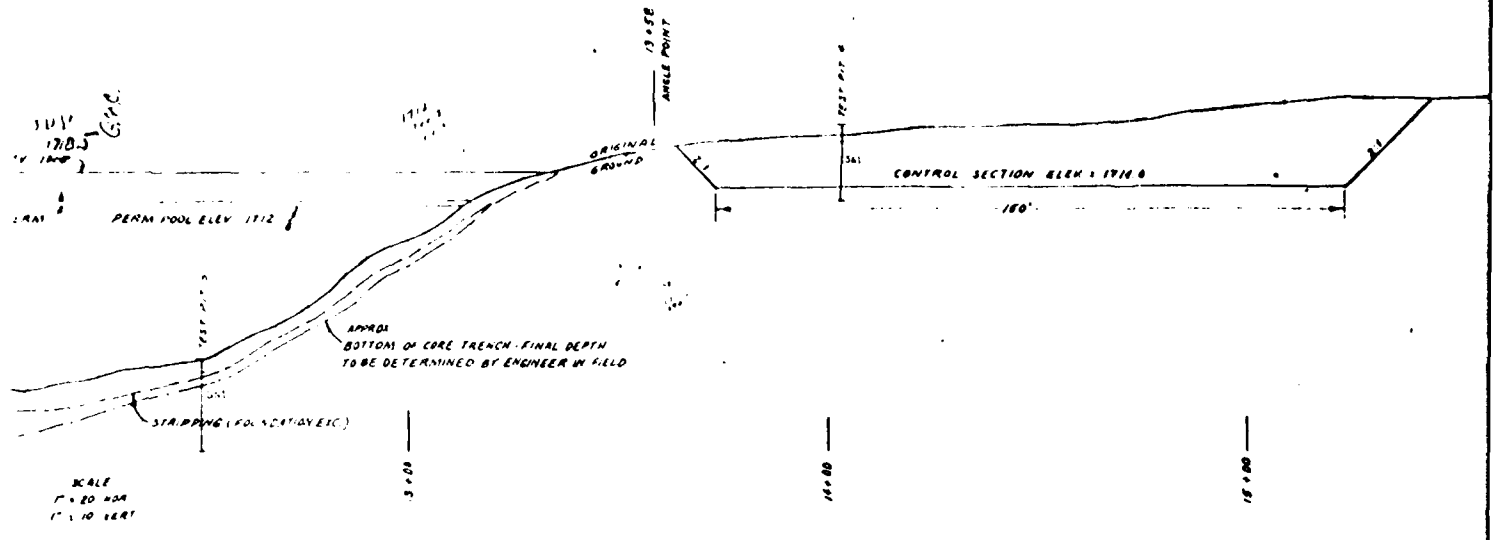
PROFILES AND SECTIONS

DRAWN	CHECKED	APPROVED	SCALE AS SHOWN	
GGK	DBW	FJK	DATE 2/61	PAGE B-3

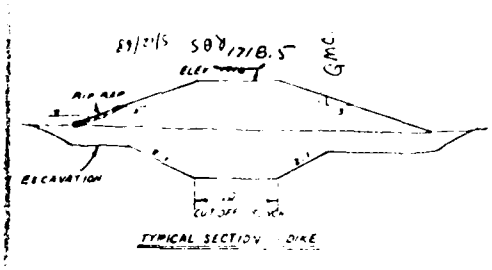
PALMER BROOK SITE
BECKET, MASSACHUSETTS
PROFILES & SECTIONS
ROBERT G. BROWN & ASSOCIATES
MONTEREY, MASSACHUSETTS

DRAWN DATE
DESIGNED
CHECKED
APPROVED

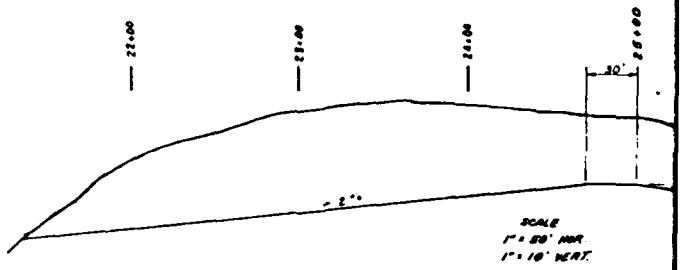
3



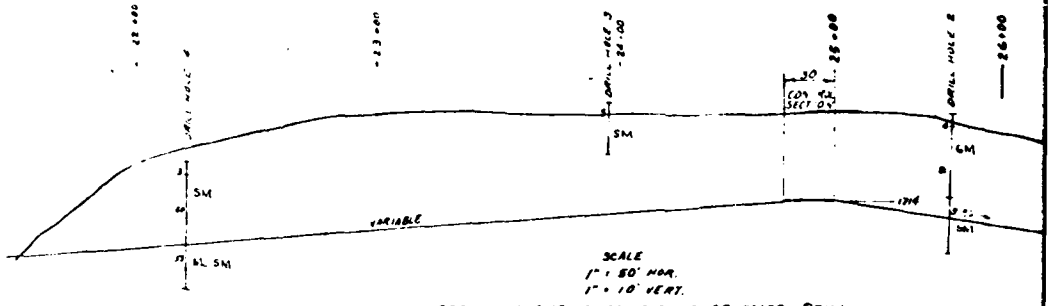
UPSTREAM EDGE OF EMERGENCY SPILLWAY CONTROL SECTION



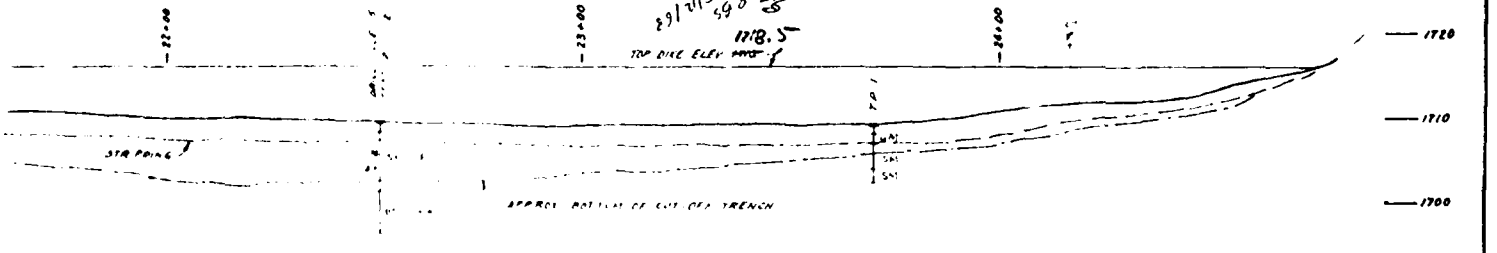
TYPICAL SECTION - DIKE



PROFILE ALONG ℄ EMERGENCY



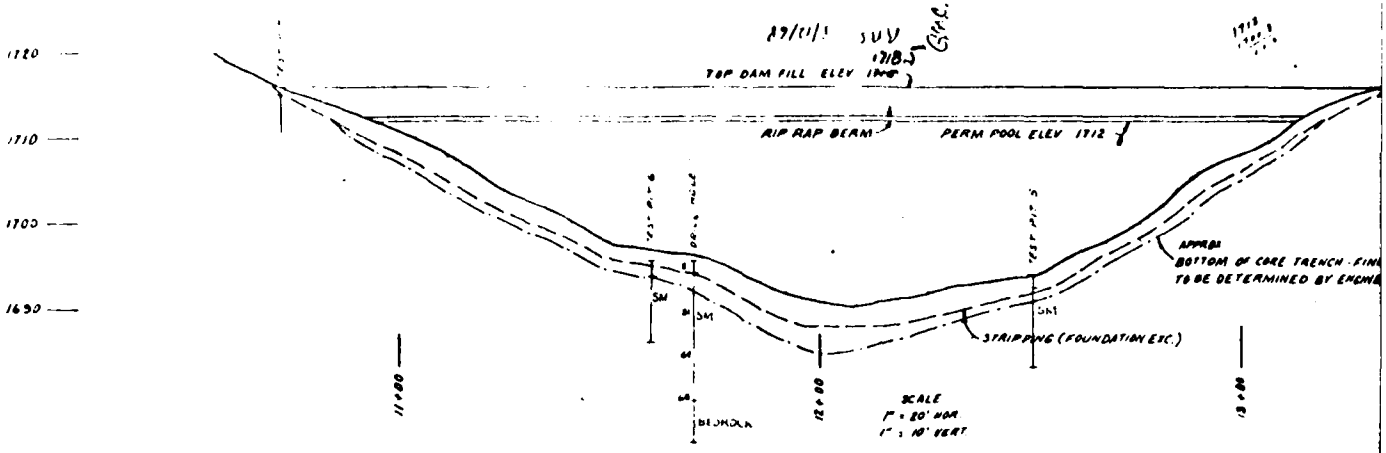
PROFILE ALONG OUTSIDE EDGE OF EMER. SPILLWAY



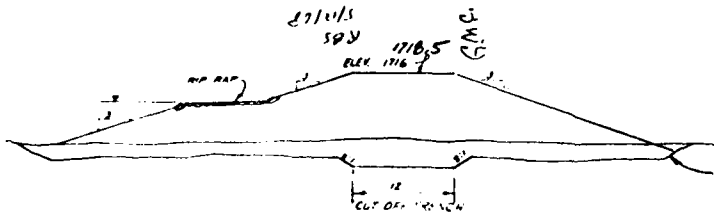
PROFILE ALONG ℄ DIKE

SCALE
1" = 20' HOR.
1" = 10' VERT.

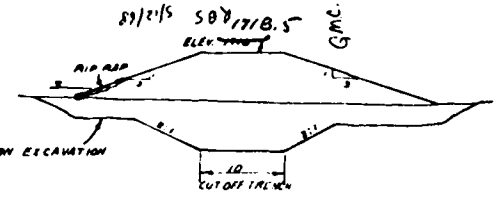
2



PROFILE ALONG DAM ℄ AND UPSTREAM EDGE OF EMERGENCY SPILLWAY CONTROL SECTION



TYPICAL SECTION - DAM

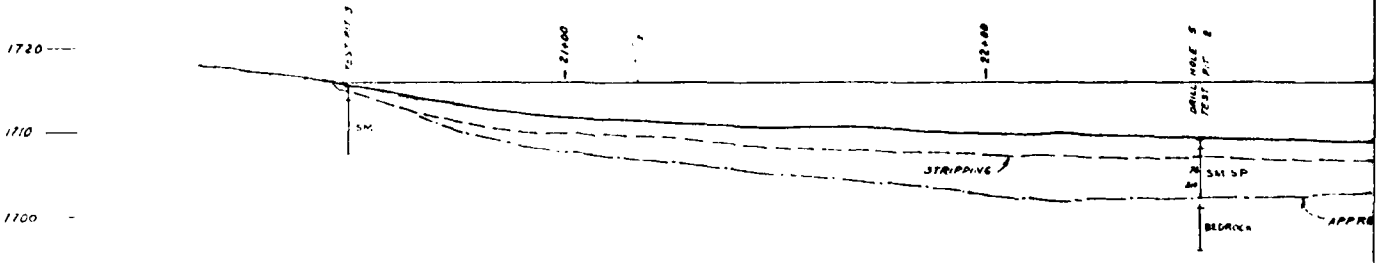


TYPICAL SECTION - DIKE

EARTH FILL REQUIREMENTS

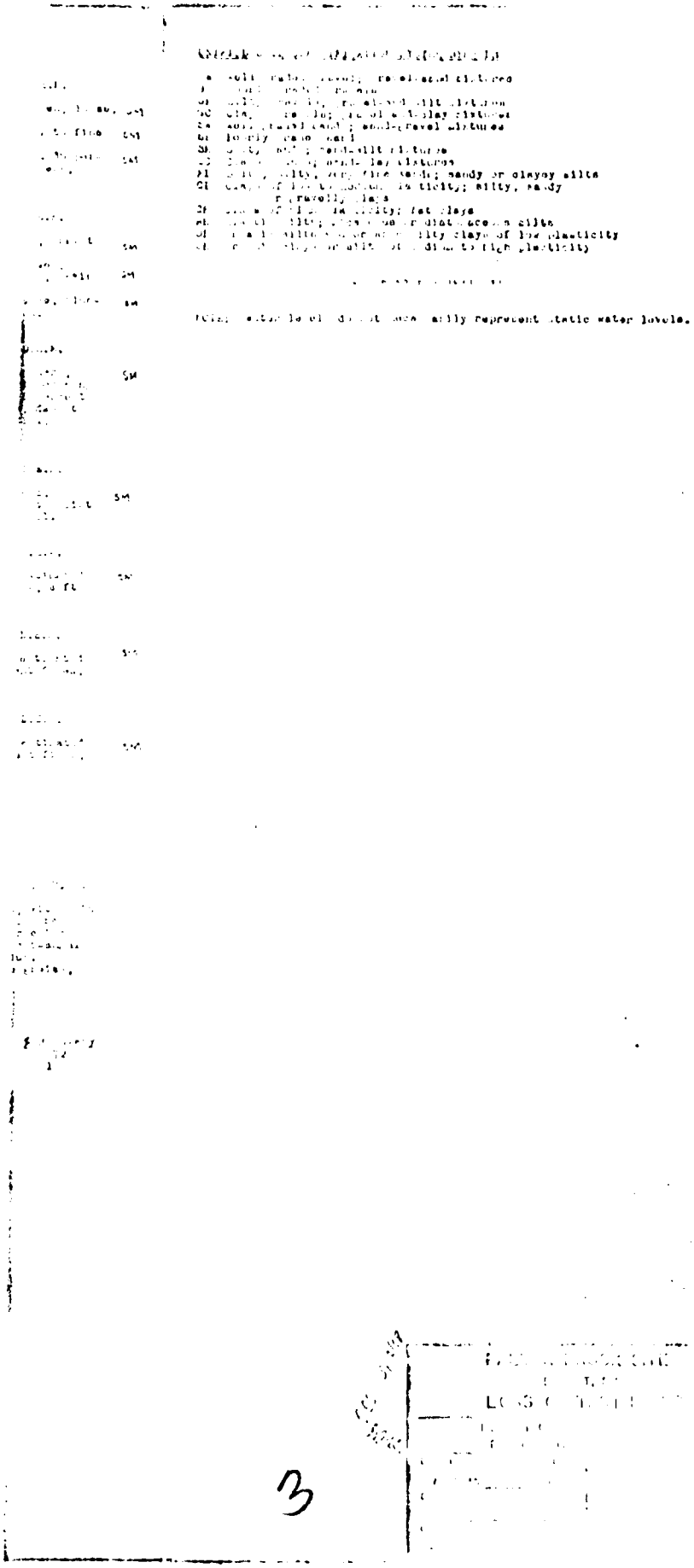
1 MAX ROCK SIZE ALLOWED IN FILL 12 IN
2 MIN COMPACTION 95 % STANDARD PROCTOR MAX DENSITY ASTM D 698
3 MOISTURE REQUIREMENTS OPTIMUM MOISTURE ± 3 %
4 MATERIAL: USE IMPERVIOUS SOIL IN CORE TRENCH AND IN CENTRAL PORTION OF DAM AND COARSER GRAVELLY SOILS TOWARD OUTER EDGES

A CENTRAL PORTION (IMPERVIOUS) REPRESENTED BY:	DH 2	4:1 IN DEPTH
	DH 4	4:10 " "
B OUTER SHELL (PERVIOUS)	DH 2	15:4 " "
	DH 3	15:4 " "
	DH 4	15:4 " "



PROFILE ALONG DIKE ℄

SCALE
1" = 20' HOR
1" = 10' VERT.



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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAM
PALMER BROOK DAM

EXPLORATION DATA

DRAWN	CHECKED	APPROVED	SCALE: AS SHOWN	
GGK	DBW	FJK	DATE: 2/81	PAGE B-2

[illegible]

d, brown, glacial till, wet below 5 feet.

gray, mottled, hornblende [illegible]

Water observation [illegible]

Depth	% Recovery
17.5 - 21.5	80

[illegible]

Log of Test [illegible]

TP-1, [illegible] [illegible]/12/57 D.E.H.

Depth	Description	
0.0 - [illegible]	Topsoil and duff.	
[illegible] - 2.[illegible]	Gravel, [illegible] cobbles, tan-brown, loose, moist to wet at 1.5 feet.	GM
2.0 - [illegible]	Cobbles and boulders with a matrix of silty to fine sand, wet, tan-brown.	SM
[illegible] - [illegible]	Sand, silty with cobbles and boulders about 35 percent fines and 10 percent cobbles and boulders, damp, olive-brown, glacial till.	SM

TP-2, [illegible] [illegible]/12/57 D.E.H.

Depth	Description	
0.0 - 1.0	Topsoil and duff.	
1.0 - 2.5	Sand, silty, about 25 percent fines, dense, gray to olive-gray, damp, alluvium.	SM
2.[illegible] - [illegible]	Gravel, with cobbles and boulders, silty, wet, blue-gray, mottled with iron stain, alluvium, seepage about 10-15 gallons H_2O per minute.	GM
[illegible] - 7.0	Sand silty, with cobbles and boulders, dense, blue-gray, could not determine water conditions.	SM

TP-3, [illegible] [illegible]/12/57 D.E.H.

Depth	Description	
0.0 - 1.5	Topsoil and duff.	
1.5 - 8.0	Sand, silty, with gravel, cobbles and boulders, slightly [illegible] at [illegible] feet [illegible] or SM at about 6 feet with about 40-50 percent fines and 5 percent cobbles and boulders, damp to moist at 5.5 feet, olive-brown glacial till, weathered in top 4.5 feet.	SM

TP-4, [illegible] 8/12/57 D.E.H.

Depth	Description	
0.0 - 2.0	Topsoil, stripped about 18 inches.	
2.0 - 9.0	Sand, silty, with some cobbles and boulders, estimated [illegible] percent boulders, dense, dry [illegible] at 8.5 feet, olive-brown, dense glacial till.	SM

TP-5, [illegible] 8/12/57 D.E.H.

Depth	Description	
0.0 - 1.5	Topsoil, stripped 18 inches.	
1.[illegible] - 11.0	Sand, silty, with cobbles and boulders, estimated about 10 percent cobbles and boulders, wet, soft olive-gray, glacial till.	SM

TP-6, [illegible] 8/12/57 D.E.H.

Depth	Description	
0.0 - 2.0	Topsoil, stripped 18 inches.	
2.0 - 10.0	Sand, silty, with cobbles and boulders, estimated 5 percent cobbles and boulders, 40 percent fines, dense, damp, olive-brown, glacial till.	SM

TP-7, [illegible] 8/12/57 D.E.H.

Depth	Description	
0.0 - 1.[illegible]	Topsoil.	
1.[illegible] - [illegible]	Sand, silty, with cobbles and boulders, estimated 4 percent cobbles and boulders, 30 percent fines, damp, dense, olive-brown, glacial till.	SM

Log of Drill Holes (continued)

DH-5, [illegible] 10/8-9/57 [illegible]

Depth	Description
0.5 - 1.[illegible]	Topsoil and roots.
1.0 - [illegible]	Sand, silty, with gravel, [illegible], with gravel lenses, about 11 percent fines, 1[illegible] percent fine sand, 7 percent medium sand, [illegible] percent coarse sand and 39 percent gravel, rounded to subangular, wet, medium permeability, dense, alluvium.
6.0 - 13.0	Bedrock, dark gray, [illegible], hornblende gneiss, moderately fractured.
13.0	Bottom of hole.

Standard Penetration Test

No.	Depth	Blows/ft.	% Recovery
1.	2.0 - 3.5	[illegible]4	72
2.	4.0 - 5.5	21[illegible]	10[illegible]

Rock Core

No.	Depth	% Recovery
1.	7.0 - 8.0	[illegible]
2.	8.0 - 13.0	[illegible]

Ground water observation
At top of ground.

[illegible]

2

LOG OF DRILL HOLES

DH-1, Elev. 1[illegible] 10/[illegible]/67 D.S.H.

0.0 - 1.5 Topsoil & rootmat.
1.5 - 16.5 Sand, silty, with gravel, SM, about 24 percent fines, 5 percent fine sand, 6 percent medium sand, 12 percent coarse sand, and 13 percent gravel, sub-rounded to sub-angular, brown to olive-brown, damp, impermeability low to impervious, dense glacial till, weathered in to 5 feet.
16.5 - 21.5 Bedrock, ray biotite, hornblende gneiss, moderately fractured.
21.5 Bottom of hole.

Standard penetration test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	2	100
2.	1.5 - 6.5	31	72
3.	6.5 -11.5	64	50
4.	11.5 -16.5	66	56

Rock Core

No.	Depth	% Recovery
1.	16.5 - 21.5	80

Ground Water Observation
At 0'1" after ½ hour.

DH-2, Elev. 1724.2 10/7-8/67 D.S.H.

0.0 - 1.5 Topsoil and rootmat.
1.5 - 16.0 Gravel, silty, SM, about 14 percent fines, 20 percent fine sand, 5 percent medium sand, 9 percent coarse sand and 52 percent gravel, angular to sub-rounded, brown, low to impermeable, low to impervious, very dense, moraine.
16.0 - 16.5 Sand, silty, with gravel, SM, about 35 percent fines, 24 percent fine sand, 7 percent medium sand, 7 percent coarse sand, angular to sub-rounded, brown to olive-brown, damp, impervious, very dense glacial till.
16.5 Bottom of hole.

Standard penetration test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	4	100
2.	5. - 6.5	81	97
3.	10.0 -11.5		56
4.	1[illegible].0 -16.5		17

DH-3, Elev. 1725.7 10/10/67 D.S.H.

0.0 - 1.5 Topsoil and rootmat.
1.5 - 6.0 Sand, silty, with gravel, SM, about 12 percent fines, 32 percent fine sand, 5 percent medium sand, 12 percent coarse sand, and 16 percent gravel, angular to sub-rounded, brown to olive-brown, damp, impervious, very dense glacial till.
6.0 - Bottom of hole.

NOTE: Test pit beside drill hole R.S.H.
0.0 - 1.5 Topsoil, charcoal duff, 50% boulders.
1.5 - 3.0 Red brown SM, 25% fines, 10% gravel, 15% cobbles, 10% boulders.
3.0 - 5.8 Tan damp SM, 35% fines, 10% gravel, 2% cobbles.
5.0 Bottom of hole.

Standard Penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	5	100
2.	4.0 - 5.5		100

Ground Water Observations
At 2'6" after ½ hour.

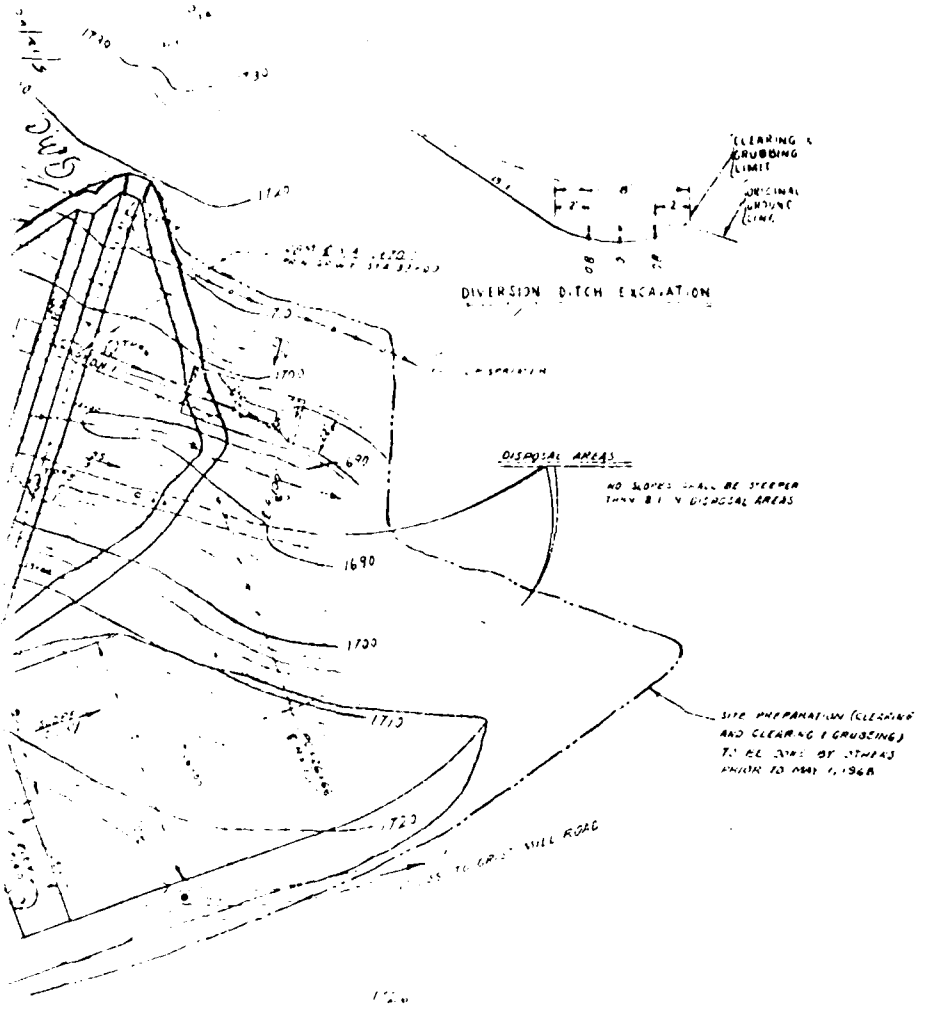
DH-4, Elev. 1718.6 10/10-11/67 D.S.H.

0.0 - 1.5 Topsoil and rootmat.
1.5 - 10.0 Sand, silty, with gravel, SM, sub-angular to sub-rounded, brown to olive-brown, damp, permeability low to impervious, dense, moraine.
10.0 - 15.0 Silt, sandy, with some gravel, ML-SM, about 35 percent silt, 21 percent fine sand, 4 percent medium sand, 11 percent coarse sand and 25 percent gravel, with more silt and less gravel at 14 feet, angular to sub-angular, grey to olive-grey, damp to moist, impervious to slightly pervious in top section, dense glacial till.
15.0 Bottom of hole.

Standard penetration Test

No.	Depths	Blows/ft.	% Recovery
1.	0.0 - 1.5	5	67
2.	5.0 - 6.5	40	100
3.	10.0 -11.5	53	67
4.	13.5 -15.0		89

Ground Water Observations
At 10' after ½ hour.



PALMER BROOK SITE
BECKET, MASSACHUSETTS
PLAN OF DAMSITE AND DIKE

ROBERT G. BROWN & ASSOCIATES
MONTEREY, MASSACHUSETTS

DRAWN	DATE	APPROVED	DATE
DESIGNED		APPROVED	
CHECKED			
		JOB NO.	SHEET OF

3

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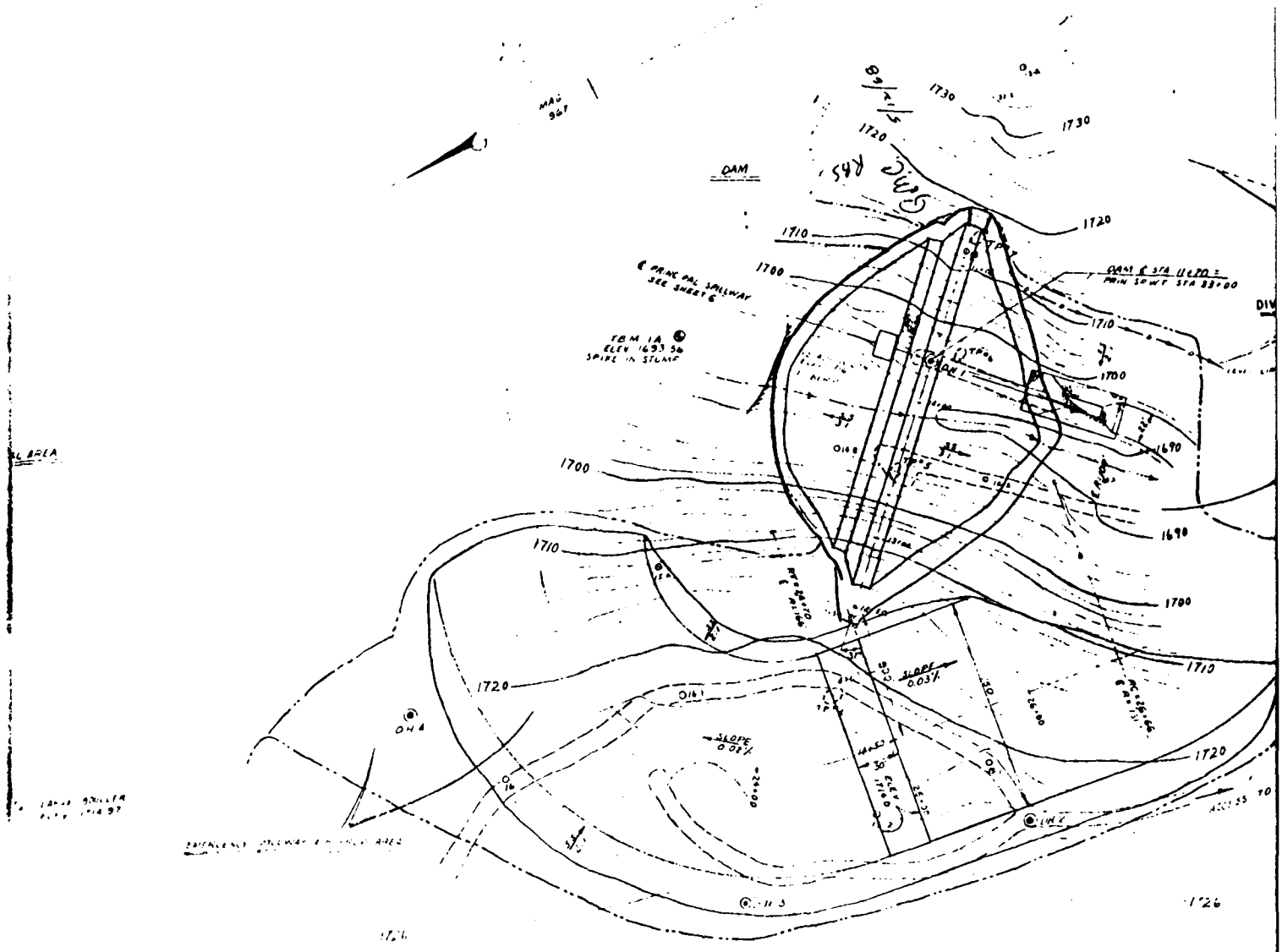
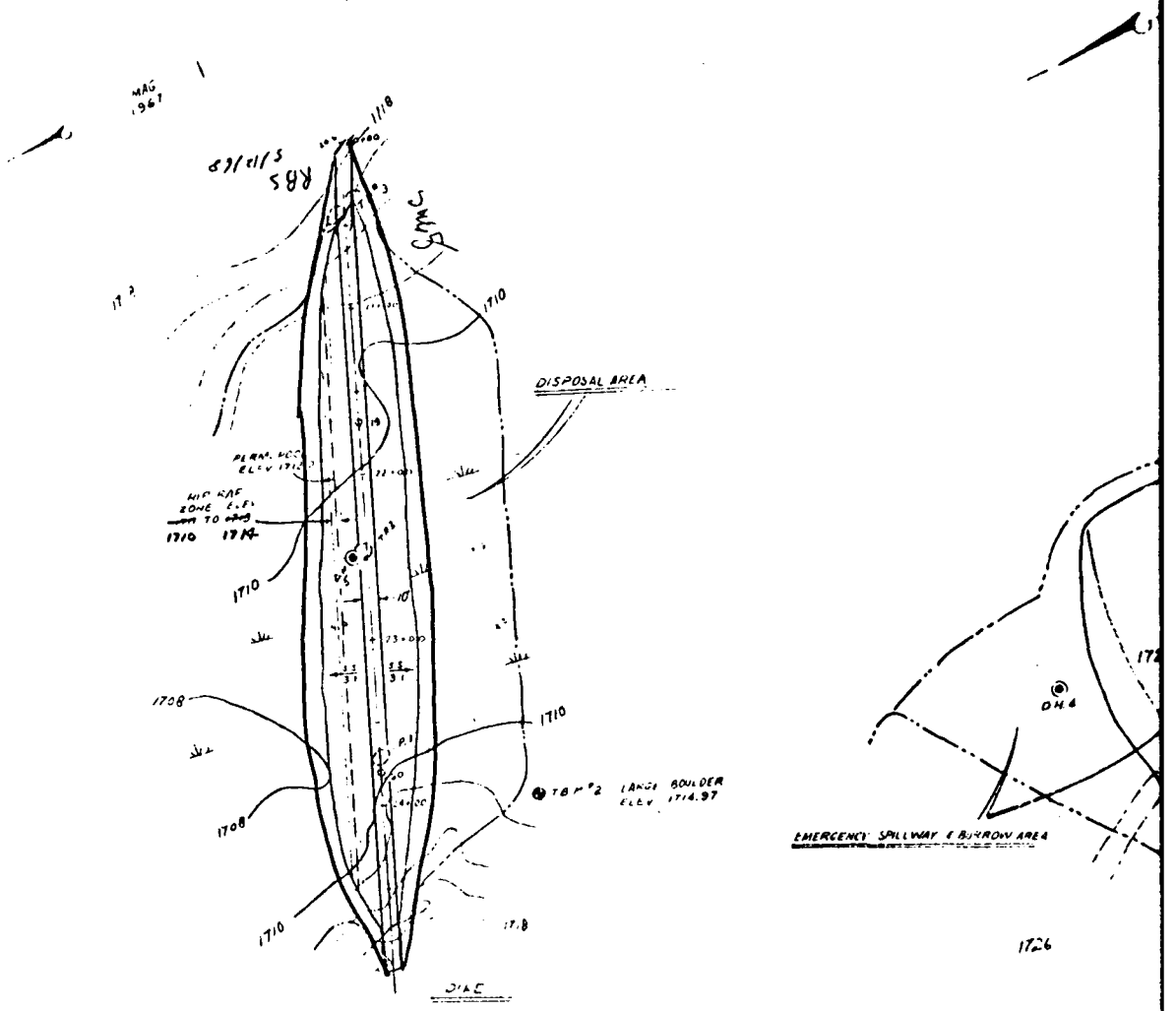
PALMER BROOK DAM

PLAN

DRAWN	CHECKED	APPROVED	SCALE: AS SHOWN
GGK	DBW	FJK	DATE: 2/81 PAGE





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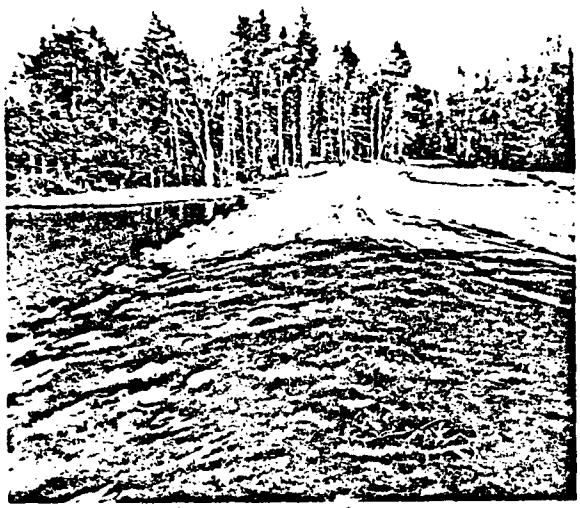
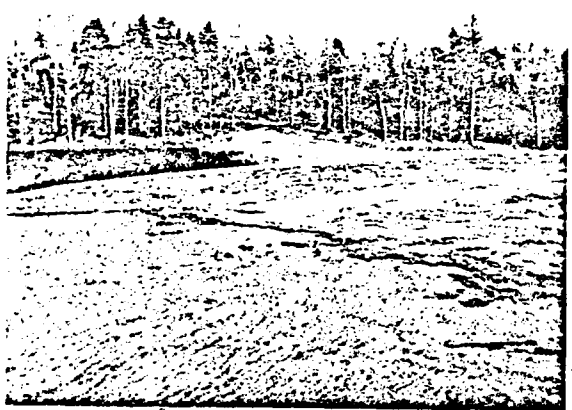


APRIL 13 1973

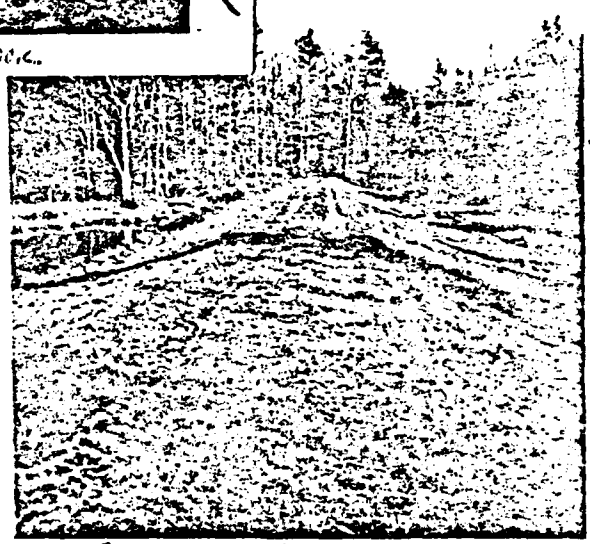
PALMER BROOK

1-2-22-1



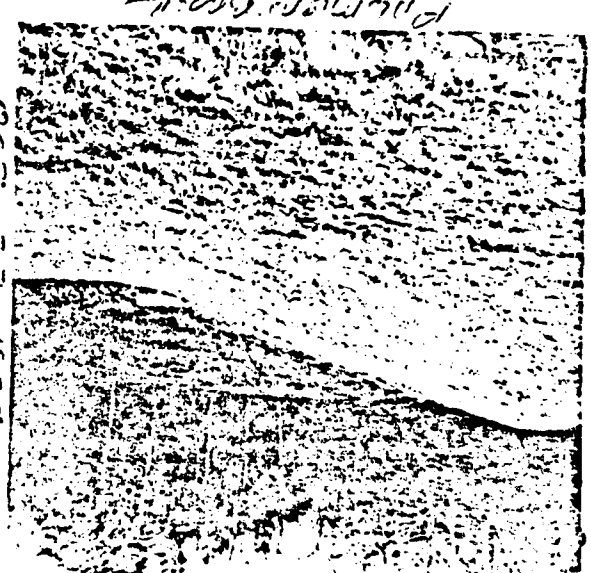
APRIL 13 1973

PALMER BROOK



PALMER BROOK DIKE

1-2-22-1



12. Remarks & Recommendations; (Fully Explain)
PREVIOUS INSPECTION DATE: OCTOBER 27, 1975

This earth structure is well maintained and appears to be safe.

For location see Topo Sheet 5-D.

13. Overall Condition:

X 1. Safe _____

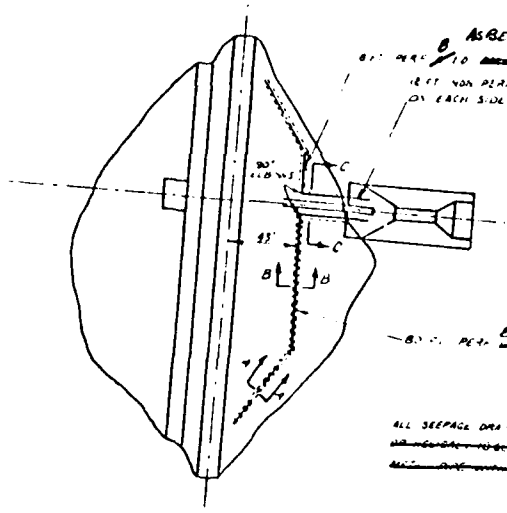
_____ 2. Minor repairs needed _____

_____ 3. Conditionally safe - major repairs needed _____

_____ 4. Unsafe _____

_____ 5. Reservoir impoundment no longer esists (explain)

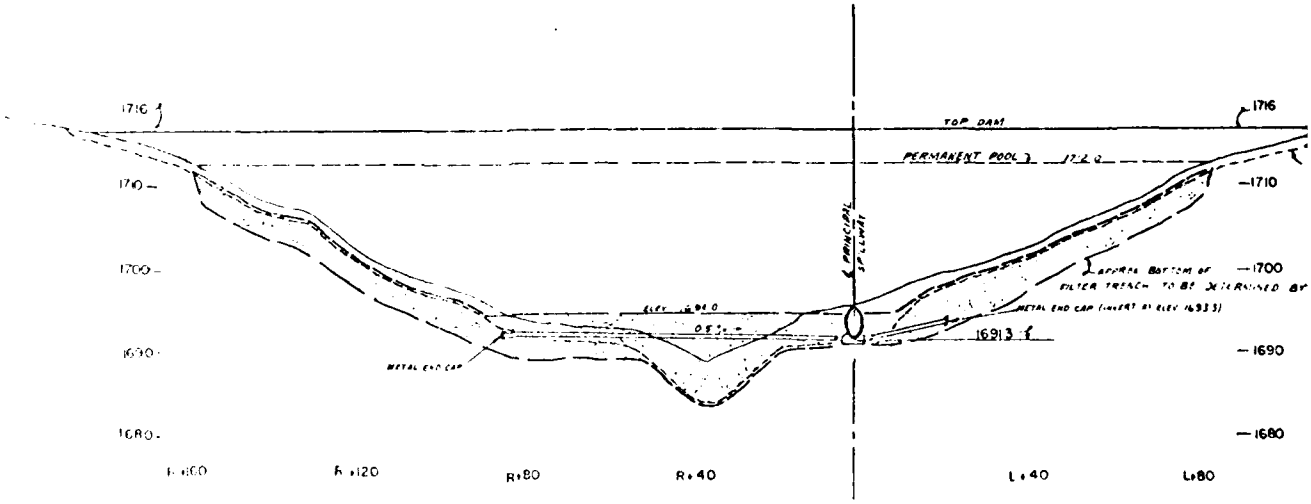
Recommend removal from inspection list _____



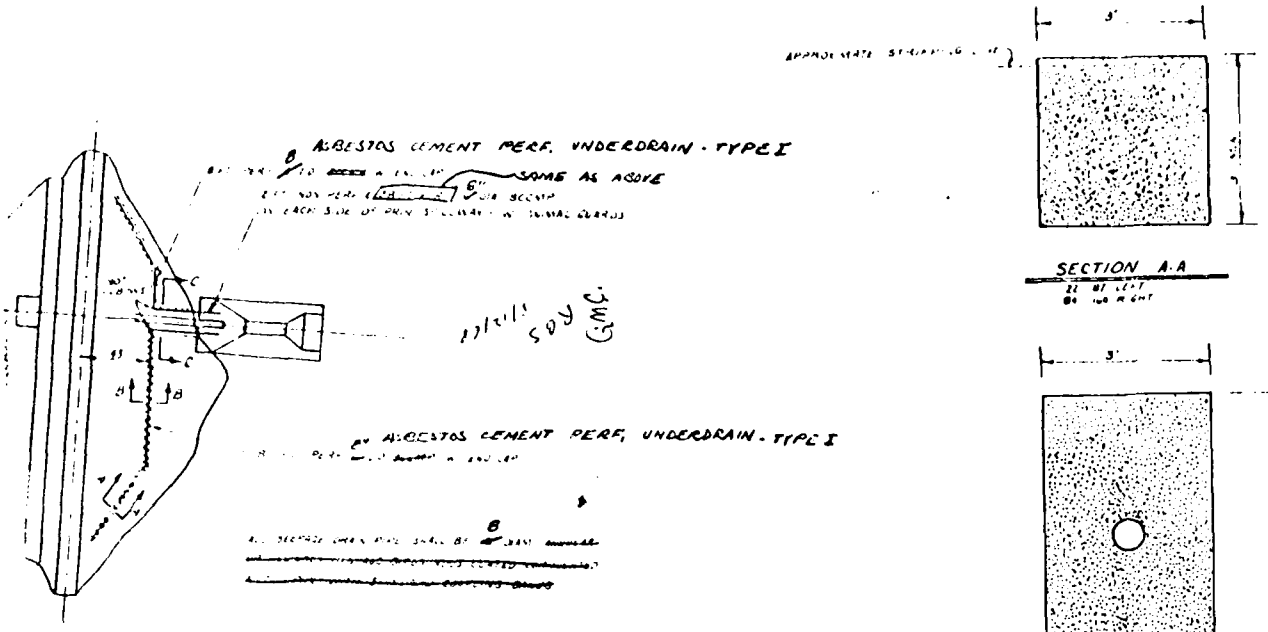
PLAN OF SEEPAGE DRAIN

0 50 100

SCALE IN FEET

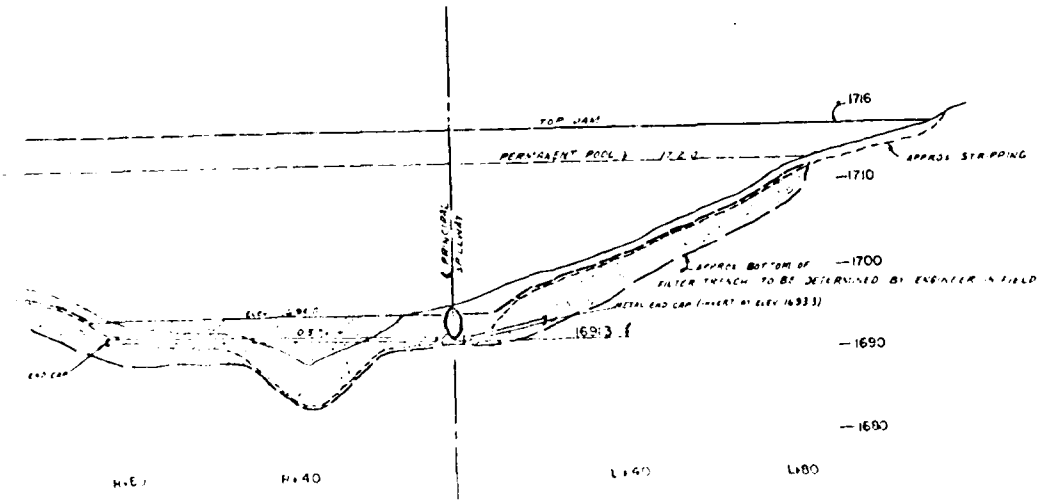


PROFILE ALONG ℄ OF SEEPAGE DRAIN LOOKING UPSTREAM



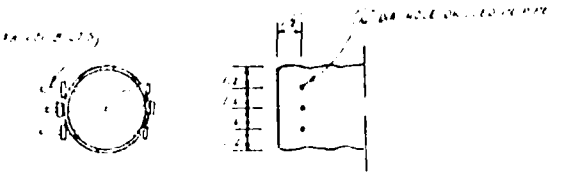
SEEPAGE DRAIN

SCALE IN FEET

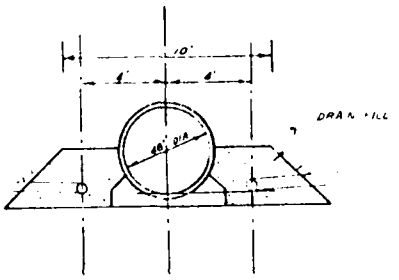


PROFILE ALONG ℄ OF SEEPAGE DRAIN LOOKING UPSTREAM

DRAIN FILL	
SIEVE NO	% PASSI
3"	100
3/4"	63 - 100
3/8"	48 - 85
NO 4	36 - 66
NO 8	26 - 52
NO 16	17 - 39
NO 30	6 - 26
NO 50	0 - 14
NO 100	0 - 6
NO 200	0 - 5



DETAIL OF SMALL ANIMAL GUARD



SECTION C-C

DRAIN FILL	
SIEVE NO.	% PASSING
3"	100
1½"	65 - 100
¾"	40 - 80
No. 4	30 - 60
No. 8	20 - 50
No. 16	12 - 30
No. 30	6 - 20
No. 50	0 - 14
No. 100	0 - 6
No. 200	0 - 3

3

PALMER BROOK SITE
BECKET, MASS
DRAINAGE DETAILS

ROBERT G. [illegible] & ASSOCIATES
MONTEREY, MASSACHUSETTS

DRAWN	DATE	APPROVED	DATE
[illegible]		APPROVED	
DESIGNED			
CHECKED			

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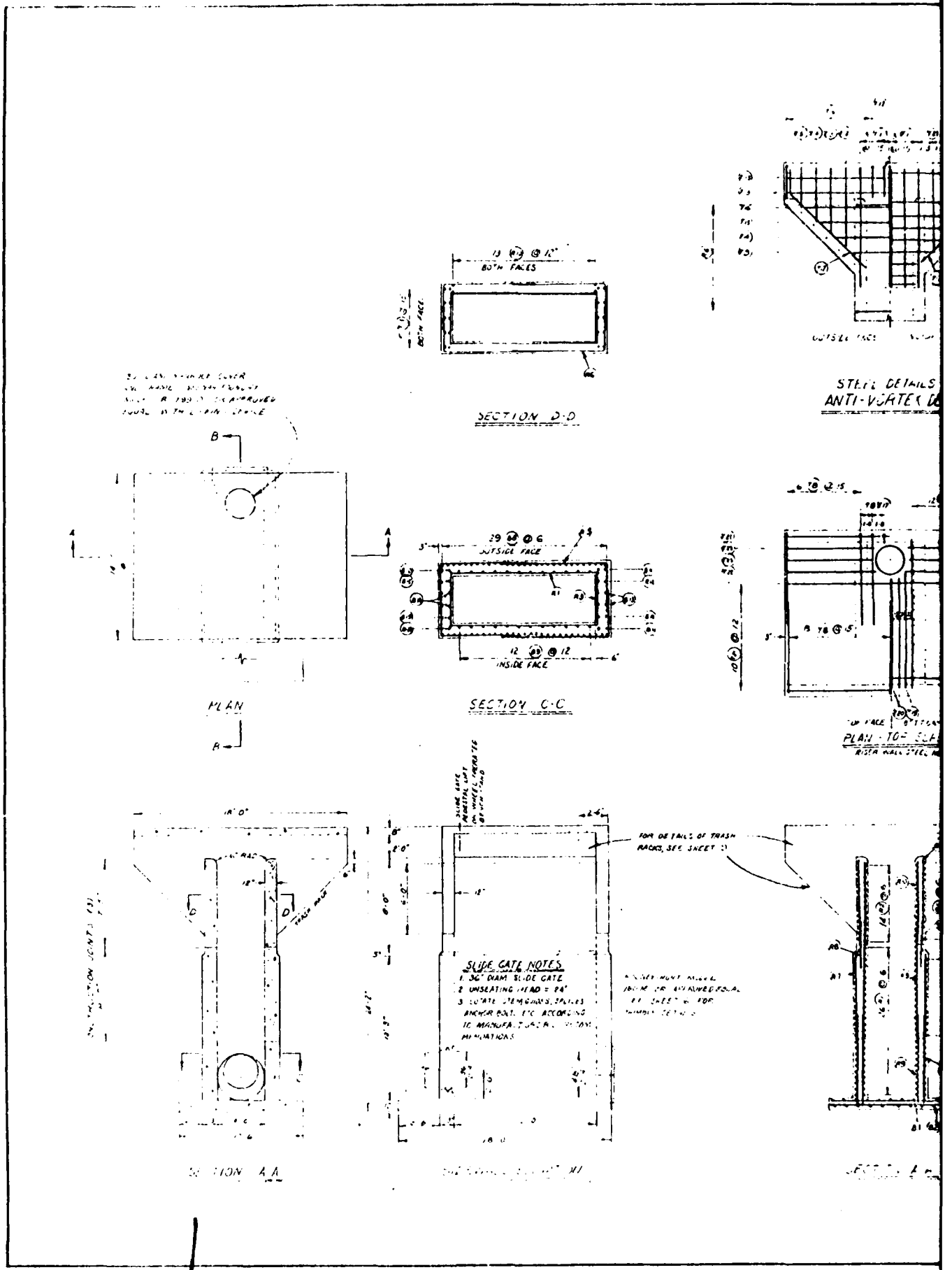
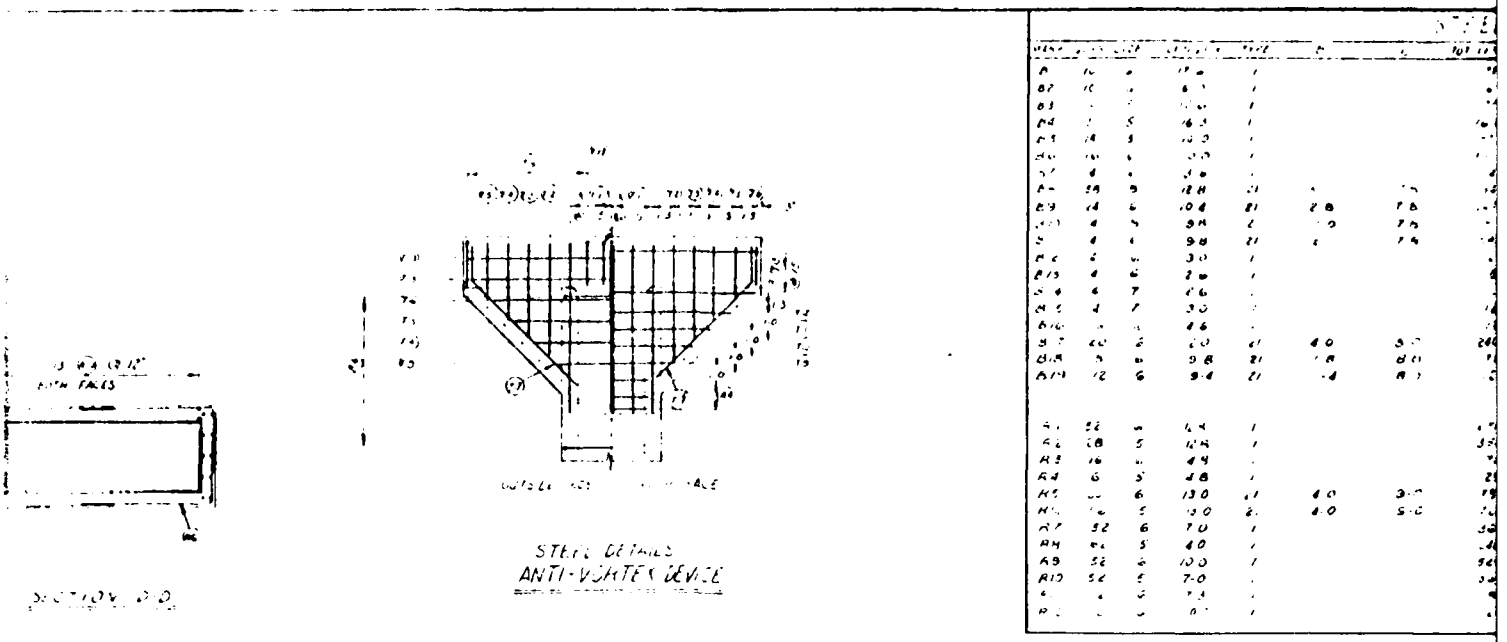
NATIONAL PROGRAM OF INSPECTION OF NON-FED
PALMER BROOK DAM

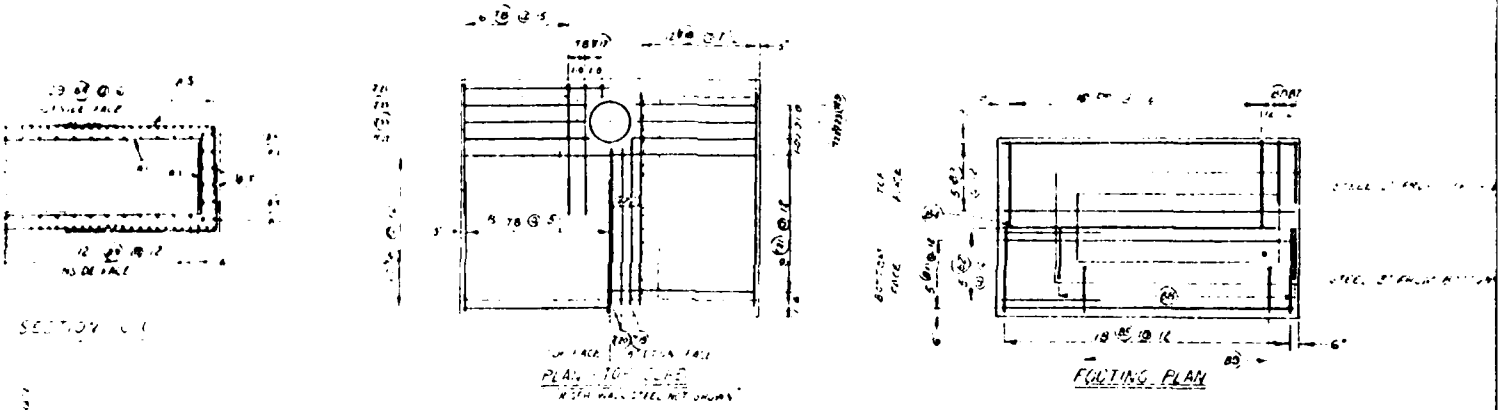
DETAILS-SHEET 1 OF 2

DRAWN	CHECKED	APPROVED	SCALE: AS SHOWN
GGK	DBW	FJK	DATE: 2/81 PAGE



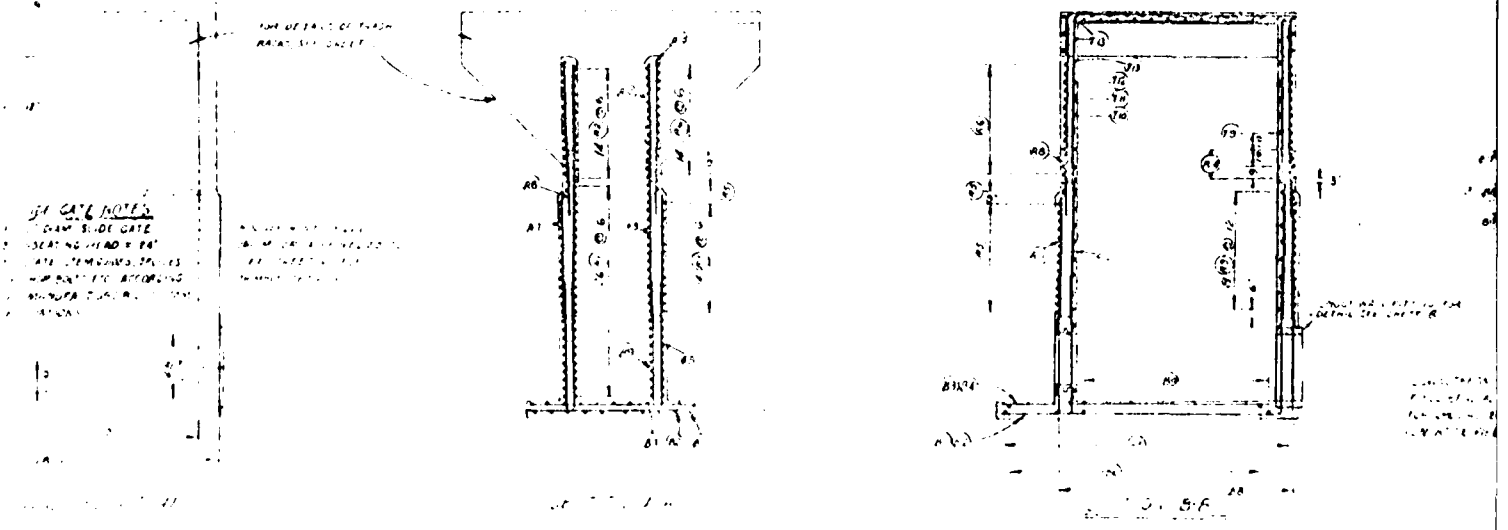


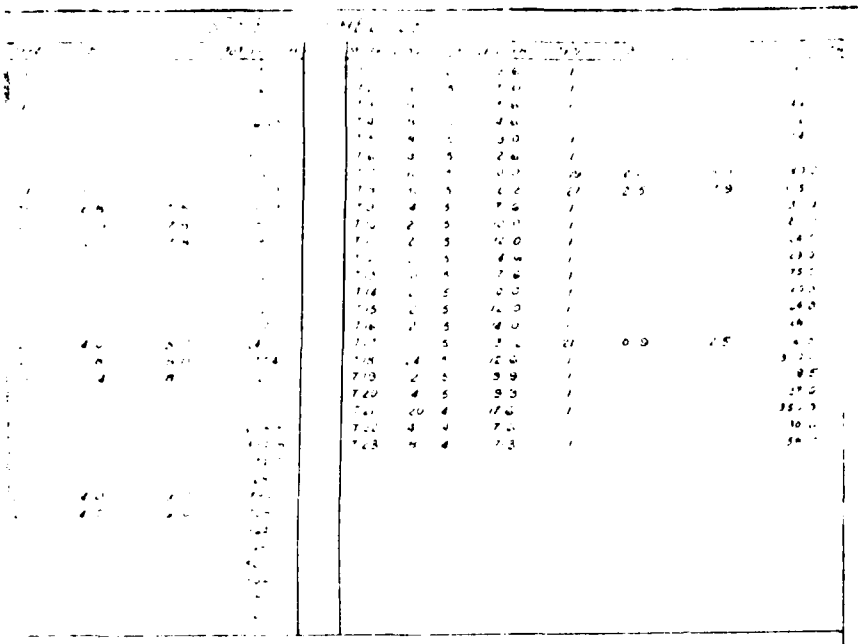
STEEL DETAILS
ANTI-VORTEX DEVICE

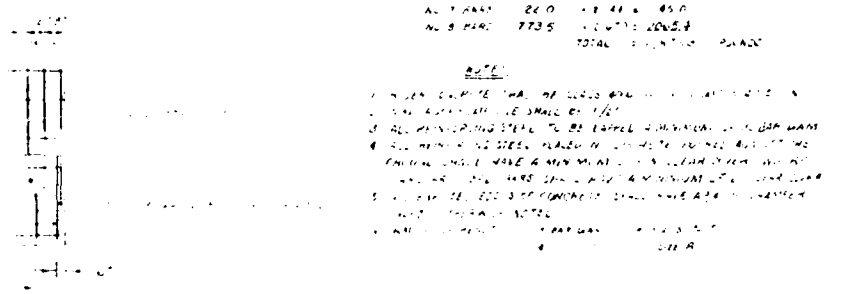


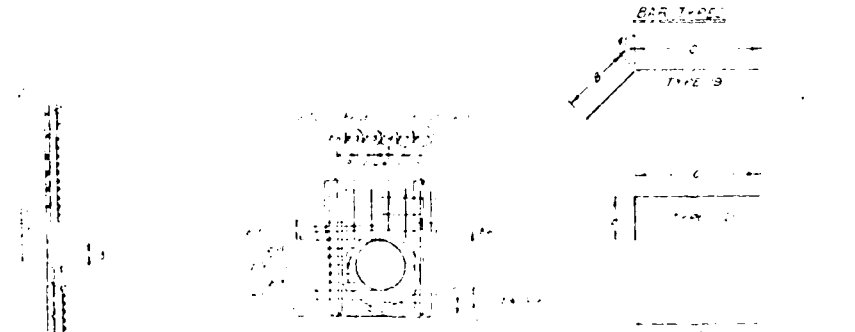
PLAN FOR SLAB

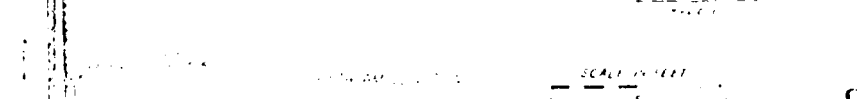
FOOTING PLAN











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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PALMER BROOK DAM

DETAILS-SHEET 2 OF 2

DRAWN	CHECKED	APPROVED	SCALE AS SHOWN	
GGK	DBW	FJK	DATE 2/81	PAGE B-6

PALMER BROOK SITE

BECKET, MASS

RISER STRUCTURAL DETAILS

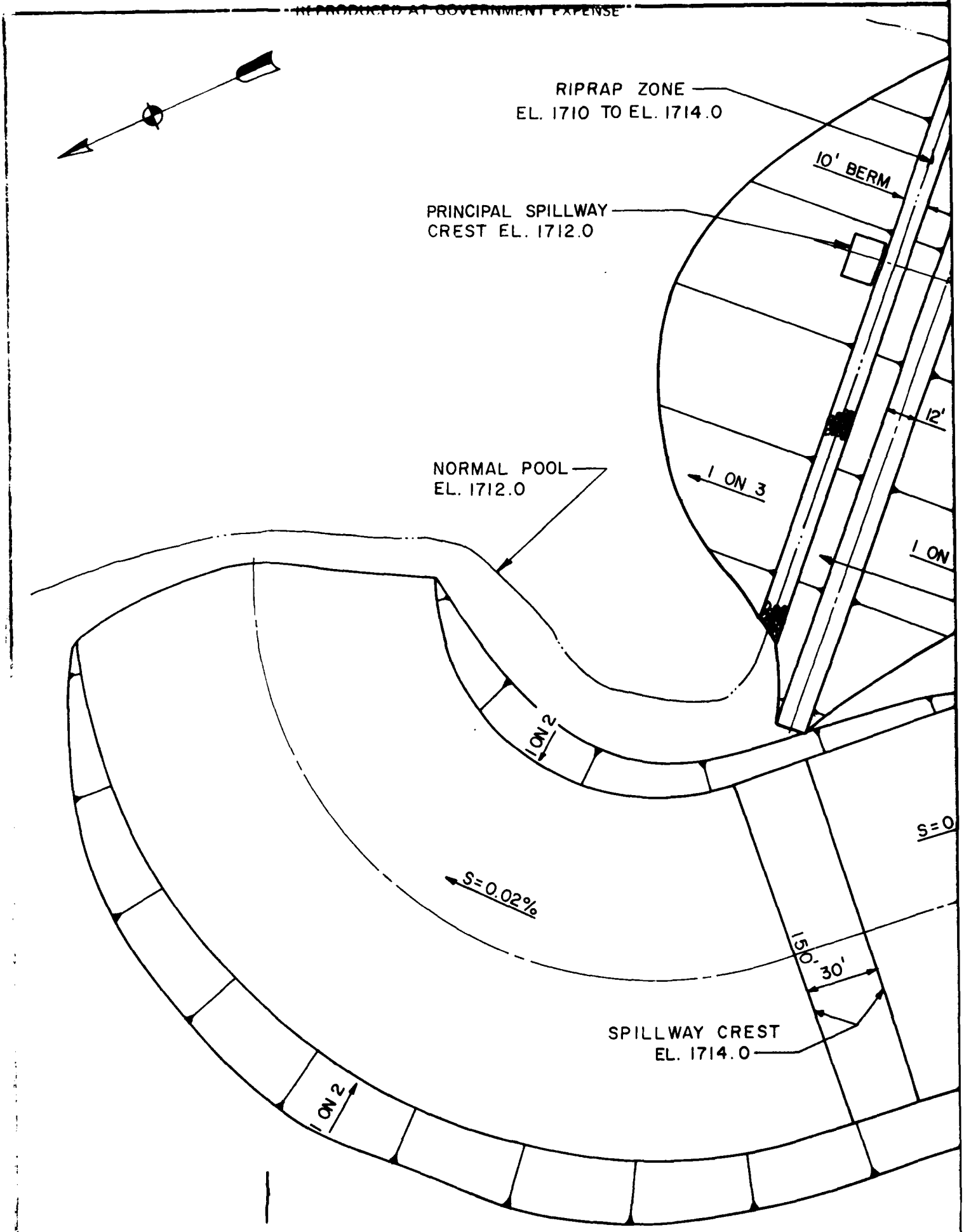
ROBERT G BROWN & ASSOCIATES

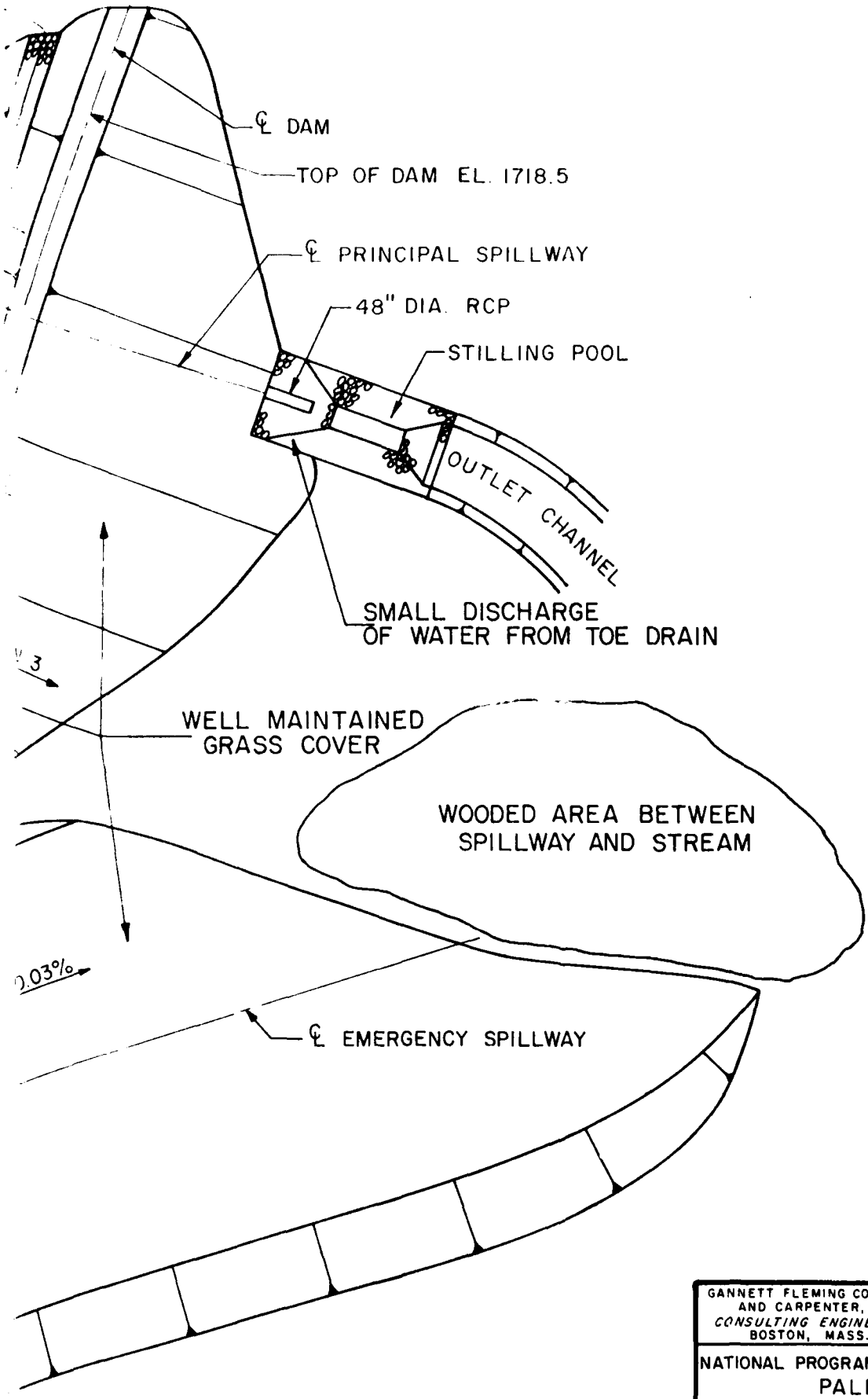
MONTEREY, MASSACHUSETTS

DRAWN	DATE	APPROVED	DATE
R.G. BROWN		APPROVED	
CHECKED			
R.G. BROWN			
CHECKED			

JOB NO. E-3 SHEET NO. 3

3





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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

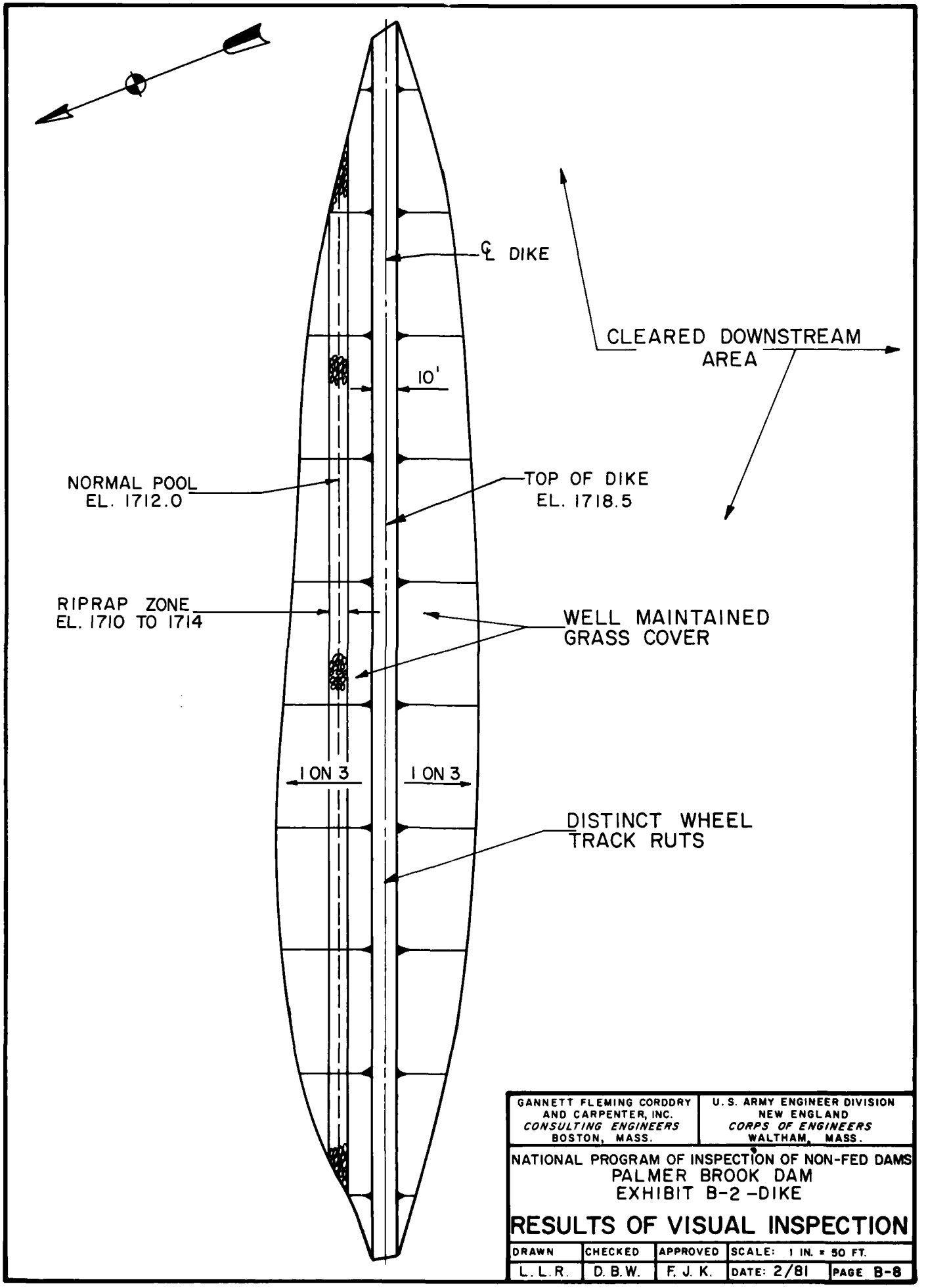
PALMER BROOK DAM

EXHIBIT B-1-DAM

RESULTS OF VISUAL INSPECTION

DRAWN	CHECKED	APPROVED	SCALE: 1 IN. = 50 FT.	
L.L.R.	D.B.W.	F.J.K.	DATE: 2/81	PAGE B-7

2



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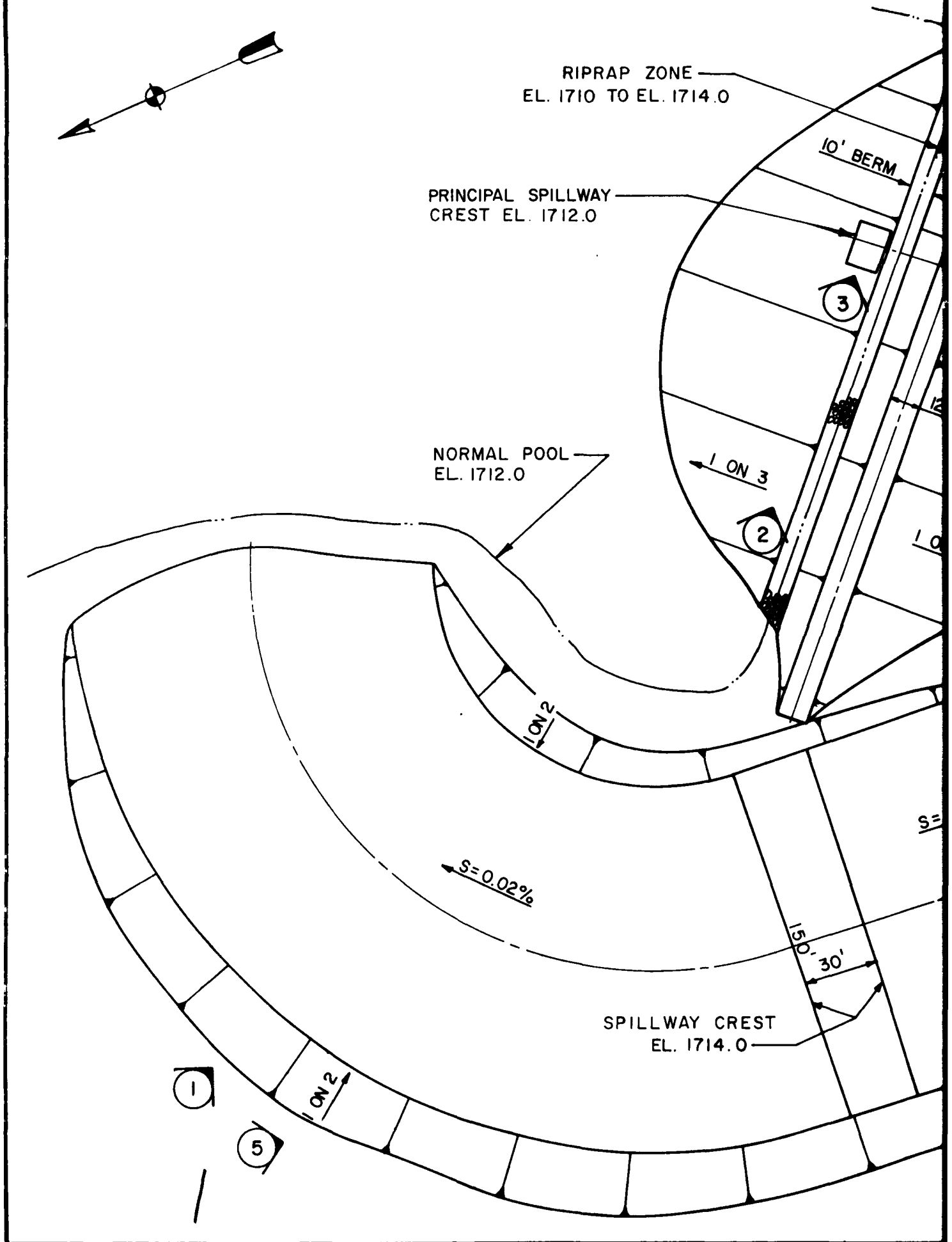
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
PALMER BROOK DAM
EXHIBIT B-2 -DIKE

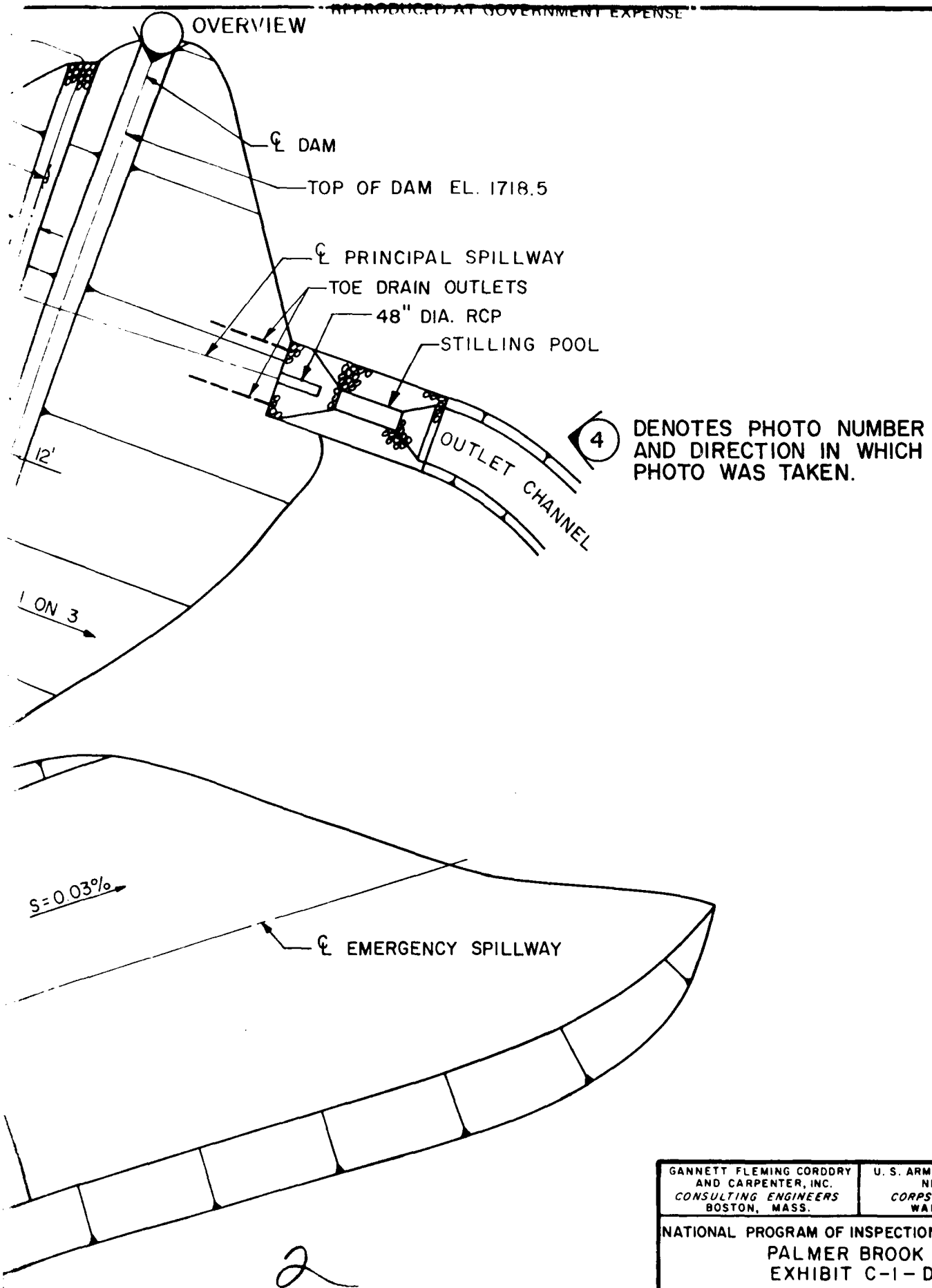
RESULTS OF VISUAL INSPECTION

DRAWN	CHECKED	APPROVED	SCALE: 1 IN. = 50 FT.	
L. L. R.	D. B. W.	F. J. K.	DATE: 2/81	PAGE B-8

APPENDIX C

PHOTOGRAPHS





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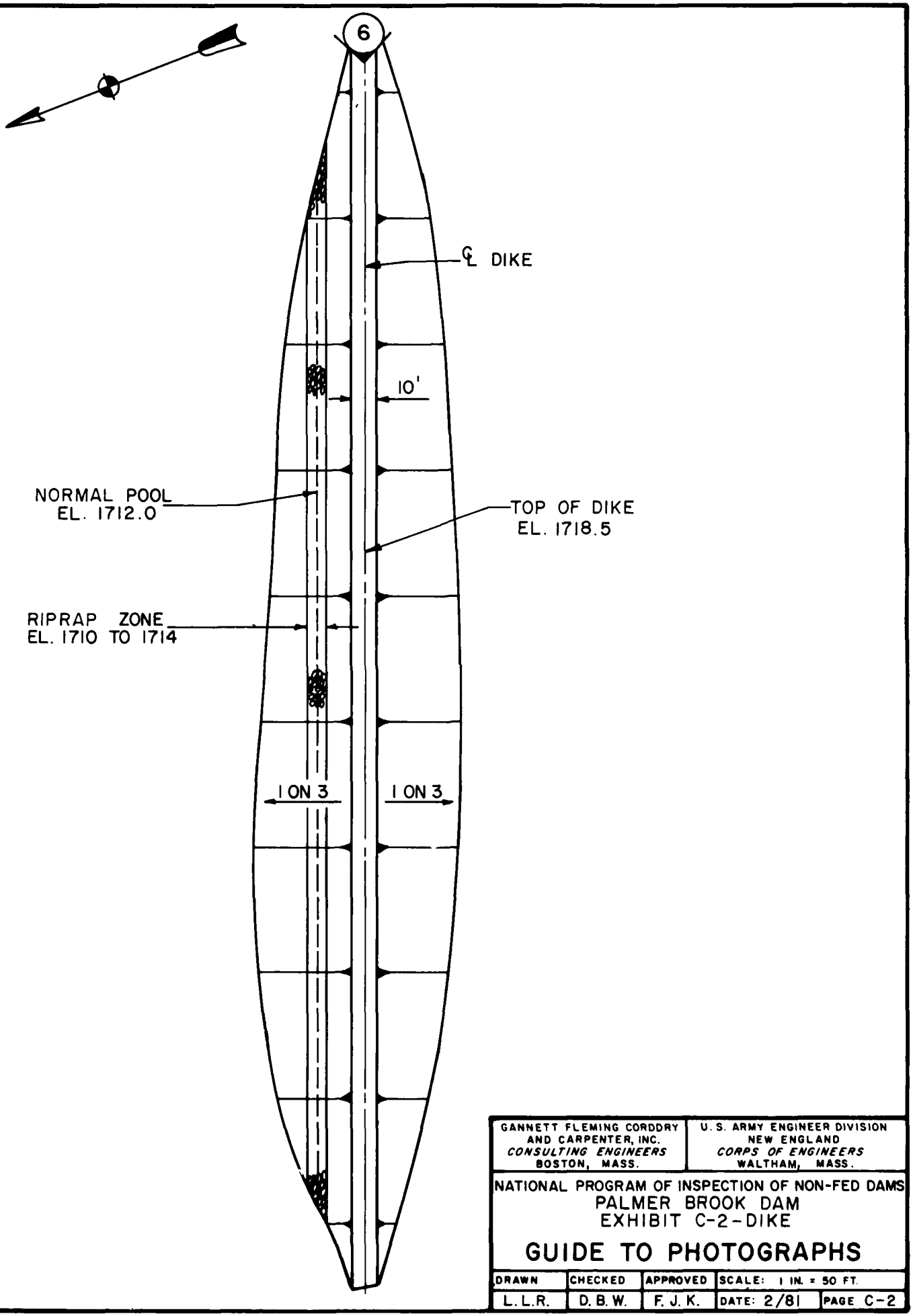
NATIONAL PROGRAM OF INSPECTION OF NON-FED

PALMER BROOK DAM

EXHIBIT C-I - DAM

GUIDE TO PHOTOGRAPHS

DRAWN	CHECKED	APPROVED	SCALE: 1 IN = 50 FT.
L.L.R.	D.B.W.	F.J.K.	DATE: 2/81 PAGE



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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
PALMER BROOK DAM
EXHIBIT C-2-DIKE

GUIDE TO PHOTOGRAPHS

DRAWN	CHECKED	APPROVED	SCALE: 1 IN. = 50 FT.	
L. L. R.	D. B. W.	F. J. K.	DATE: 2/81	PAGE C-2

Photo No. 1

View of the upstream face of the dam. The grass-lined emergency spillway is on the right.

Photo No. 2

View of the upstream slope looking toward the left abutment. The service spillway intake is in the left center of the photo. Note mowed grass and boulder riprap.

Discussion of Results (Cont'd)

The volume of this "permanent" storage is 280 acre-ft, so the total outflow volume without failure is V_o = 1,560.5 - 280.0 = 1,280.5 acre-ft. The pool level that would be produced at Ward Pond, ignoring any outflow through the railroad culverts, is Elevation 1559.8. If outflow were considered, the pool level at Ward Pond would be somewhat lower. Using this approximation for a pre-failure stage at Ward Pond, the rise in pool level due to dam failure would be at least 5 feet.

A similar approximate estimate can be made for a "dry" failure (failure occuring with water at the principal spillway crest level. The storage released would be 1,492 acre-ft, which would produce a pool level in Ward Pond equal to El. 1561.3 (with no allowance for outflow), which is 16.3 feet higher than the normal pool level (El. 1545.0)

The cottages along the shoreline of Ward Pond are located between approximately Elevation 1550.0 and Elevation 1565.0. Most of the cottages are used throughout the year. Regardless of the failure mode, the results described above indicate that failure would probably cause loss of more than a few lives, and that a "high" hazard classification is warranted.

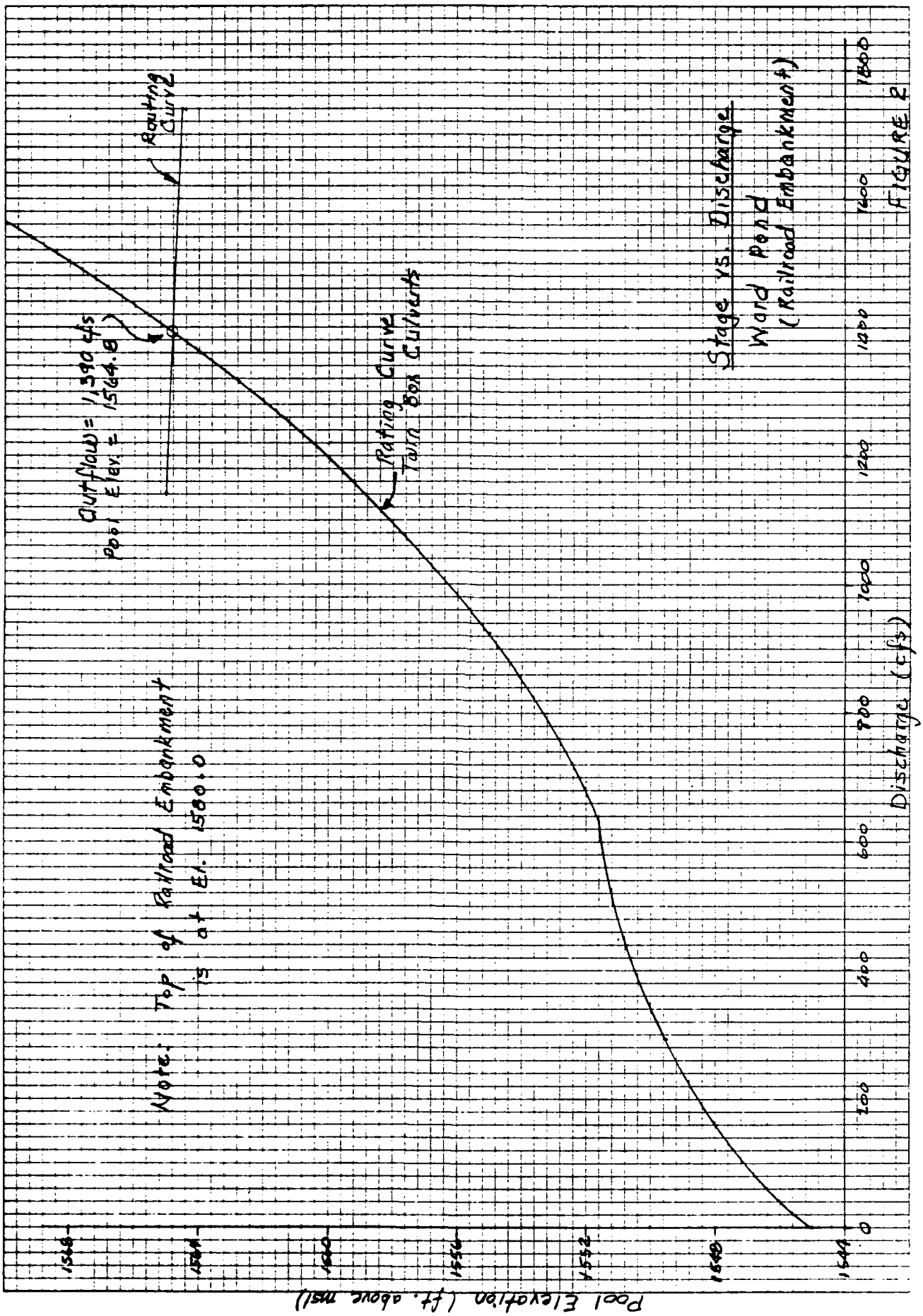

Stage vs. Discharge
Ward Pond
(Railroad Embankment)
Outflow = 1,390 cfs
Pool Elev = 1564.8'
Routing Curve
Rating Curve
Twin Box Culverts
Note: Top of Railroad Embankment
is at El. 1560.0
Pool Elevation (ft. above msl)
Discharge (cfs)
1544
1548
1552
1556
1560
1564
0
200
400
600
800
1000
1200
1400
1600
1800

FIGURE 2

Routing Curve for Ward Pond

$$Q_{p2} = Q_{p1}\left(1 - \frac{\text{Surcharge Storage}}{\text{Hydrograph Volume}}\right)$$

Q_{p1} = 17,570 cfs
Hydrograph Vol. = 2,180 acre-ft

Pool Elev.	Surcharge Storage (acre-ft)	Q_{p2} (cfs)
1545.0	0	17,570 ✓
1560.0	1,300 ✓	7,092
1564.5	1,964 ✓	1,741
1565.0	2,038 ✓	1,144

Rating and routing curves are plotted on Figure 2 (next sheet). From Figure 2, the results are:

Maximum pool level @ R.R. embankment = 1564.8
Maximum outflow = 1,390 cfs
Remaining freeboard @ R.R. embankment = 15.2'

Discussion of Results

The results presented above are for failure of Palmer Brook Dam. The normal procedure to evaluate pre-failure levels is not applicable because the steady state pre-failure discharge of 1,860 cfs is larger than the routed failure outflow of 1,390 cfs. An accurate evaluation of pre-failure stages would require a complete routing computation similar to the one for dam failures. An approximation of the pre-failure stage in Ward Pond can be determined from the PMF volume and by assuming no outflow from the railroad culvert. The total PMF volume entering Palmer Brook reservoir is 1,560.5 ✓ acre-ft (19 inches of runoff over 1.54 mi^2). Since it was assumed that the pool was initially at the principal spillway crest, but that the principal spillway would become clogged, there would be some water "permanently" stored between the principal spillway crest and the auxiliary spillway crest. ✓

Basic Data Cont'd

Storage Data

Elevation	Area (acres)	Δ Elevation (ft)	Surcharge Storage (ac-ft)
1545.0	33		0
1550.0	79	5	280
1560.0	125	10	1300
1570.0	170	10	2775
1580.0	235	10	4800

Rating Curve - Railroad Embankment

d (ft)	A (ft²)	T (ft)	*Q (cfs)	V (ft/sec)	V²/2g (ft)	Pool El.
0	0	0	0	0	0	1545.0
2	20	10	160	8.0	1.0	1548.0
3	30	10	295	9.8	1.5	1549.5
4	40	10	454	11.3	2.0	1551.0

* $Q^2 = gA^3/T$ (applies until Pool El = 1551.3)

Pool Elev.	H (ft)	**Q (cfs)
1552.0	3.85	694
1555.0	6.85	926
1560.0	11.85	1,218
1570.0	21.85	1,654
1580.0	31.85	1,997

** $Q = (0.7)(5)(6.3)(2)\sqrt{2gH}$ (applies above Pool El. 1551.3)

Note: Since total storage in Palmer Brook Dam at failure (2,180 acre-ft) is less than available surcharge storage @ R.R. embankment (4800 acre-ft); R.R. embankment will not be overtopped.

Route Failure Discharge Through Ward Pond

Description of Conditions:

Ward Pond is a small natural lake located downstream from Palmer Brook Dam. At the outlet of Ward Pond, there is a 35-foot high railroad embankment (now abandoned). A twin box culvert, with each opening 5' wide x 6.3' high, goes under the embankment. Many cottages are located along the shoreline of Ward Pond between 5' and 10' above the normal pool level. At the downstream end of the twin box culverts, there is a steep chute section.

Just beyond the railroad embankment is the Massachusetts Turnpike embankment. The roadway embankment is about 30 feet high and has a single culvert 16' wide x 7' high through it.

Method of Analysis:

The failure discharge will be routed through Ward Pond as if the railroad embankment were a dam. Since the culvert under the Turnpike is much larger than the culverts under the railroad embankment, it is assumed that discharge will be controlled solely by the railroad culverts. It will also be assumed that no blockage of the culverts by debris occurs.

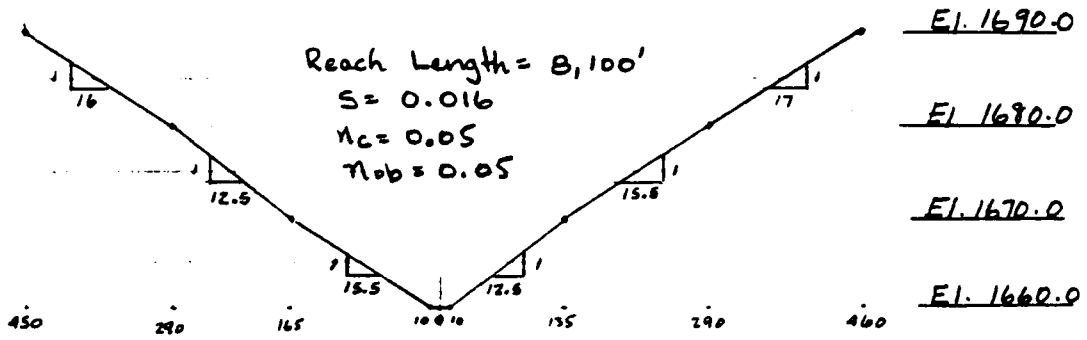
A critical depth analysis ($Q^2 = gA^3/T$) will be used for the railroad culverts until the pool level reaches the top of the culvert. At that point, pressure flow is assumed to occur and the orifice equation will be used ($Q = CA\sqrt{2gH}$) with $C = 0.7$. Overtopping will be modeled using a 1000-foot length at a constant elevation.

Basic Data:

Culverts: 2 @ 5' wide x 6.3' high; invert @ El. 1545.0

Normal pool El = 1545.0; Top R.R. embankment El = 1580.0

Stream Section 1



1" = 20' VERT.
1" = 200' HOR.

Rating Curve - Section 1

d (ft)	Q (cfs)	A (ft²)
3.0	1p34	186.0
5.0	3,386	450.0
10.0	18,489	1600.0
11.0	24,667	1914.0

Reach Outflow : Reach 1

Pre-failure stage in Reach 1 :
For Q = 1,860 cfs ; stage = 3.9' Area = 290.9 ft².

Q_{p1} = 19,780 cfs Stage = 10.2' Area = 1660.9 ft²
Δ Area = 1660.9 - 290.9 = 1,370 ft²

$$V_1 = \frac{(1{,}370\ ft^2)(8{,}100\ ft)}{43560\ ft^2/acre} = 254.8\ acre\text{-}ft$$

Check for $V_1 \leq S/2$ where S = storage at test flood level
Since 254.8 < 2180/2 , reach length of 8100' is O.K.

$$Q_{p2} = Q_{p1}(1 - V_1/S) = 19{,}780\left(1 - \frac{254.8}{2180}\right) = 17{,}468\ cfs\ \checkmark$$

Stage for Q_{p2} = 9.8' Area = 1540.6 ft²
Δ Area = 1540.6 - 290.9 = 1249.7 ft² ✓

$$V_2 = \frac{(1249.7)(8100)}{43560} = 232.4\ acre\text{-}ft$$

$$V_{avg} = \frac{V_1 + V_2}{2} = \frac{254.8 + 232.4}{2} = 243.6\ acre\text{-}ft$$

$$Q_{p2} = Q_{p1}\left(1 - V_{avg}/S\right) = 19{,}780\left(1 - \frac{243.6}{2180}\right)$$

$$Q_{p2} = 17{,}570\ cfs$$

Dam Failure Analysis

Since test flood (PMF) level is lower than the top of the dam, dam failure will be analyzed with pool at test flood level (El. 1716.6). Storage at time of failure = 2,180 acre-feet. Outflow just prior to failure = 1,860 cfs.

Breach Outflow

$Q_B = 8/27\ W_b \sqrt{g}\ Y_o^{3/2}$

$Y_o = 31.6'$ ✓

$W_b \leq$ 40% of dam length at mid-height

$W_b \leq (0.4)(150) \leq 60'$

Use $W_b = 60'$

$Q_B = (8/27)(60)(32.2)^{1/2}(31.6)^{3/2}$

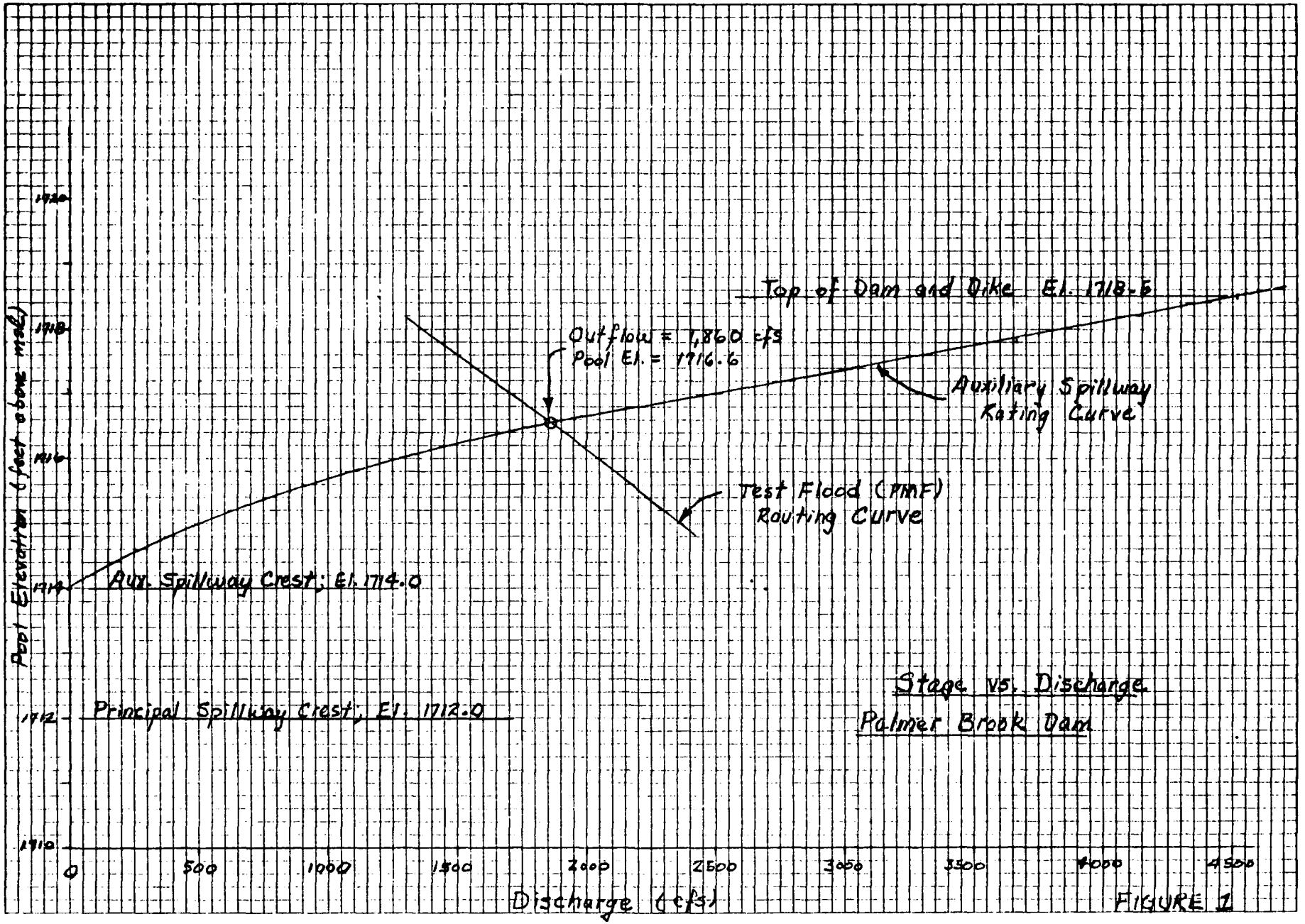
$Q_B = 17,920$ cfs ✓

Remaining spillway flow: since breach would not occur at the auxiliary spillway, the remaining spillway flow, Q_{se}, is equal to the spillway discharge just prior to failure. $Q_{se} = 1,860$ cfs

Total Failure Outflow = $Q_{P_1} = Q_B + Q_{se}$

$Q_{P_1} = 17,920 + 1,860$

$Q_{P_1} = 19,780$ cfs ✓



Stage vs. Discharge
Palmer Brook Dam

FIGURE 1

D-4

3a of 9

Auxiliary Spillway Rating Curve (Cont'd)

d(ft)	A(ft²)	T(ft)	*Q(cfs)	V(ft/s)	V²/2g (ft)	Pool El.
0	0	0	0	0	0	1714.00
1	152.0	154.0	856.9	5.6	0.49	1715.49
2	308.0	158.0	2,440.2	7.9	0.97	1716.97
3	468.0	162.0	4,513.8	9.6	1.44	1718.44

* $Q_{AS} \equiv (gA^3/T)^{1/2}$

Note: The top of dam elevation = 1718.5 and Q_{AS} = 4514 cfs at pool level El. 1718.44, which is larger than the test flood inflow (Q_{P1}) of 3,280 cfs. Since $Q_{AS} > Q_{P1}$, auxiliary spillway alone will pass the test flood, and no rating curves for the dam or the dike will be required. Therefore:

$$Q_T = Q_{AS}$$ ✓

Routing Curve for Test Flood (PMF)

$$Q_{P2} = Q_{P1}\left(1 - \frac{Stor}{k}\right)$$

Q_{P1} = 3,280 cfs

Stor = storage in inches

$$Stor = \frac{\text{Storage (acre-ft)} \times 12}{1.54 \times 640}$$ ✓

Start routing with pool at principal spillway crest

Pool Elev.	Storage (acre-ft)	Stor (inches)	Q_{P2} (cfs)
1712.0	0	0	3,280
1714.0	280 ✓	3.41 ✓	2,690 ✓
1718.5	991 ✓	12.07	1,197 ✓

From Results Shown on Figure 1 (next sheet):

Pool Elev. resulting from test flood (PMF) = El. 1716.6 ✓
Top of dam elevation = El. 1718.5 ✓
Auxiliary spillway discharge = 1,860 cfs ✓
Remaining freeboard = 1.9 feet ✓

Test Flood Inflow

For the size (intermediate) and hazard classification (high hazard) of Palmer Brook Dam, the recommended test flood is the PMF.

Using the curve for rolling terrain, the discharge per square mile for a 2 square mile area (minimum value given on chart) is 2,130 cfs/mi². For the drainage area of 1.54 mi²:

Test Flood Inflow = $Q_{P_1} = (1.54\ mi^2)(2{,}130\ cfs/mi^2)$

$Q_{P_1} = 3{,}280$ cfs (PMF)

Combined Rating Curve

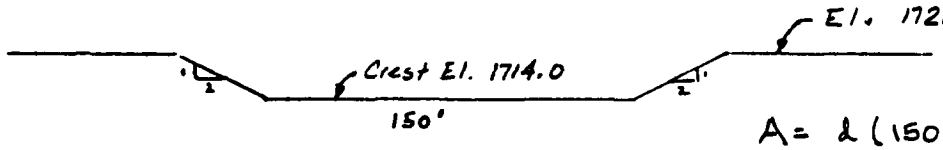
The total outflow, Q_T, is the sum of the principal spillway flow, the auxiliary spillway flow, flow over the top of the dam, and flow over the top of the dike:

$$Q_T = Q_{PS} + Q_{AS} + Q_E + Q_D$$

For the purposes of this analysis, it will be assumed that the grating on the principal spillway becomes clogged with debris and $Q_{PS} = 0$.

Auxiliary Spillway Rating Curve

Auxiliary spillway is a trapezoidal channel with a 2% adverse slope in the approach area and a 3% slope in the exit area. A critical depth analysis will be used, and approach losses will be neglected.



Spillway Section

NOT TO SCALE

$A = d(150 + 2d)$

$T = 150 + 4d$

Palmer Brook Dam
Basic Data

Drainage Area = 1.54 mi^2

Watershed Classification : Rolling terrain

Size: Intermediate (33.5' high; maximum storage 2,483 acre-ft) ✓

Hazard Classification: High hazard

Reservoir Surface Area:

At principal spillway crest (normal pool):	134 acres
At auxiliary spillway crest:	146 acres
At top of dam:	170 acres

Elevations:

Streambed at toe of dam:	El. 1685.0
Downstream invert of outlet works:	El. 1691.0
Upstream invert of outlet works:	El. 1691.5
Principal spillway crest (normal pool):	El. 1712.0
Auxiliary spillway crest:	El. 1714.0
Top of dam:	El. 1718.5
Ground at toe of dike:	El. 1708.0
Top of dike:	El. 1718.5

Storage Capacity:

At principal spillway crest (normal pool):	1,492 acre-ft ✓
At auxiliary spillway crest:	1,772 acre-ft ✓
At top of dam:	2,483 acre-ft ✓

Lengths:

Auxiliary spillway crest:	150 feet
Top of dam:	290 feet
Top of dike:	470 feet
48" ϕ outlet conduit:	120 feet

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

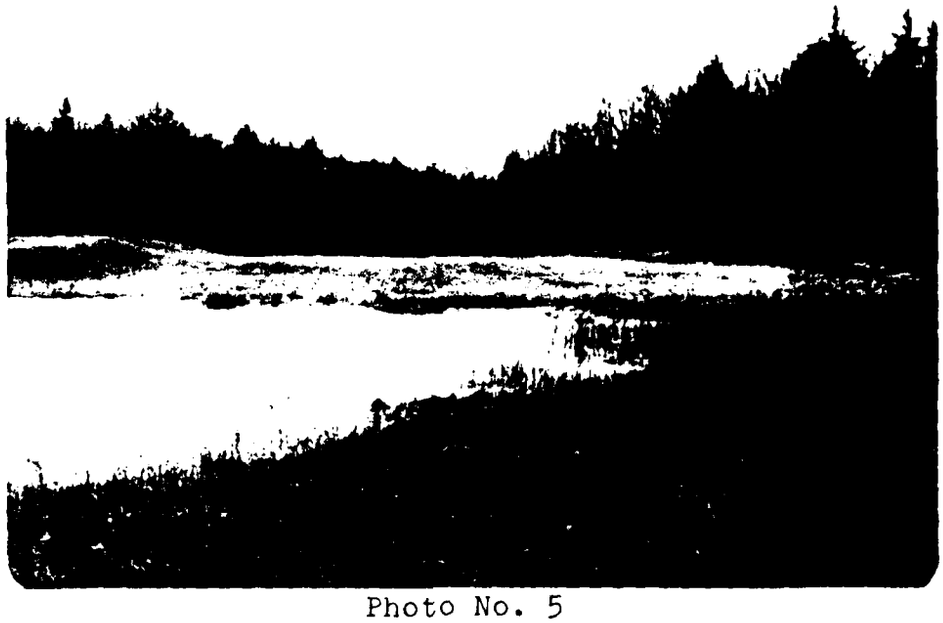


Photo No. 5

View of grass-covered emergency spillway, looking downstream from right bank of approach channel.

Photo No. 6

View of dike, looking toward right abutment. Note mowed grass and wheel tracks.

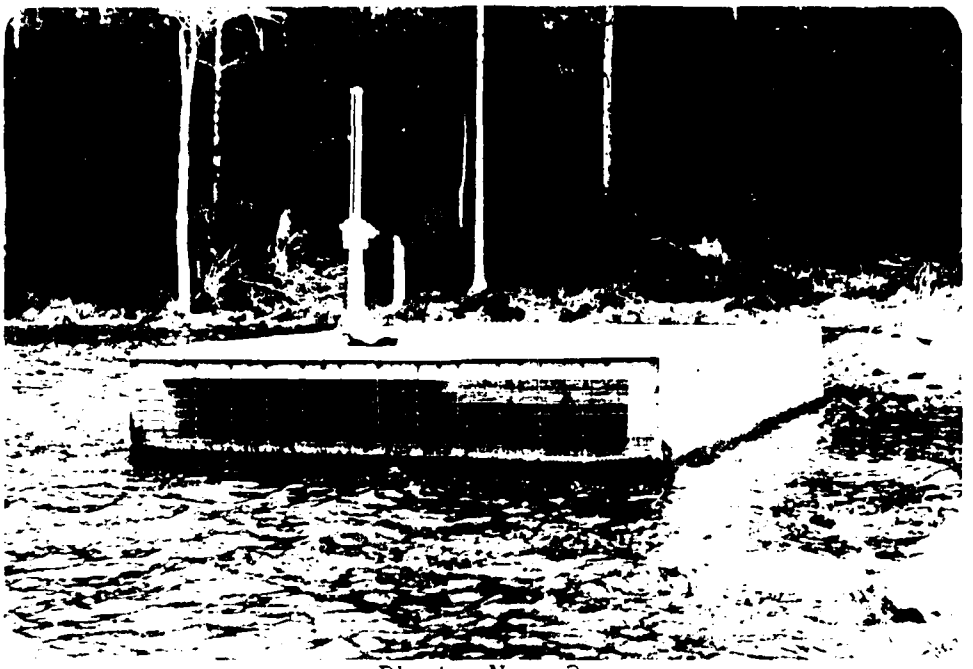
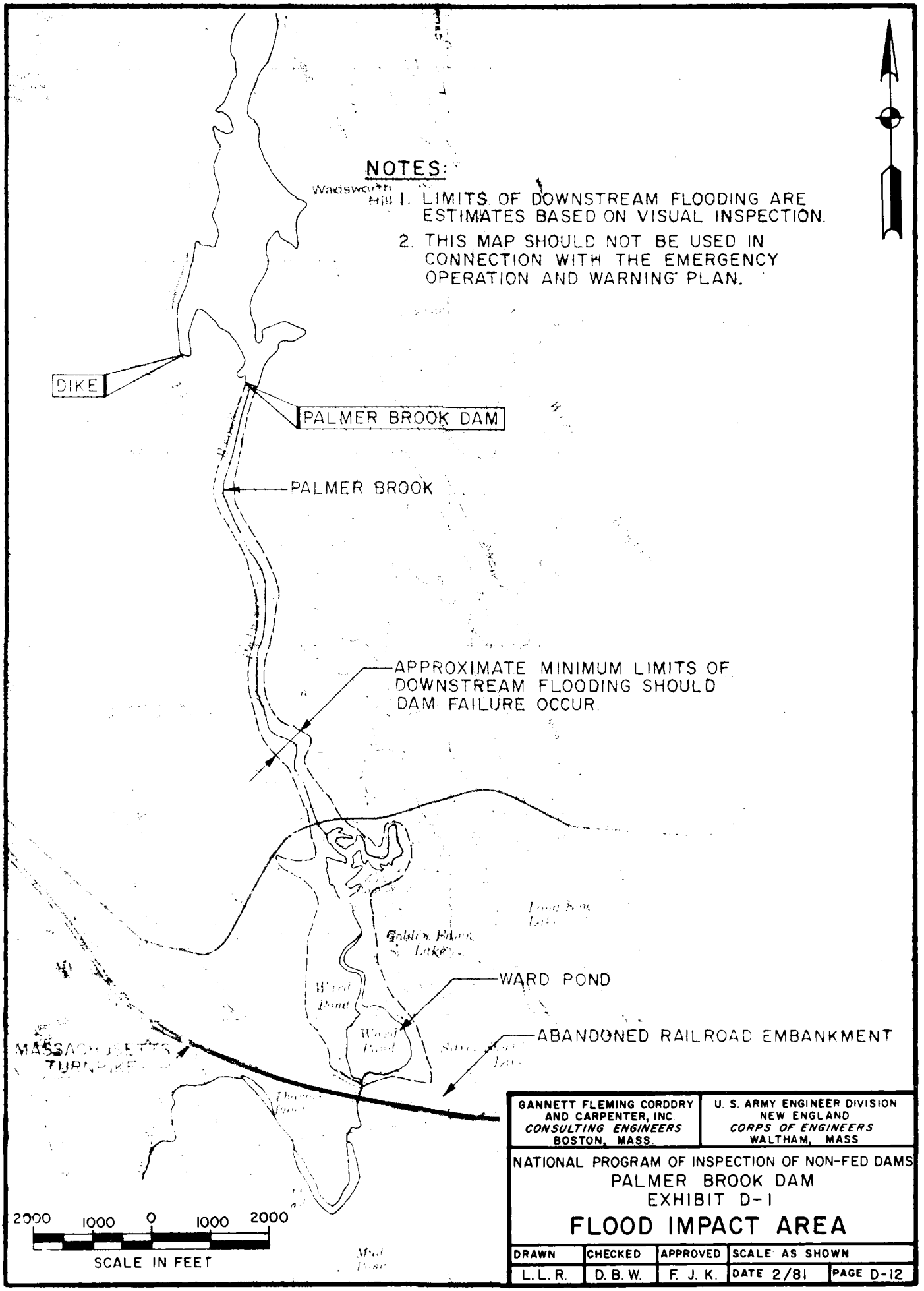


Photo No. 3

View of the service spillway intake. Note trash screens and slide gate operating mechanism.

Photo No. 4

View of downstream slope, principal spillway outlet conduit, and stilling pool and exit channel.



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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PALMER BROOK DAM

EXHIBIT D-1

FLOOD IMPACT AREA

DRAWN	CHECKED	APPROVED	SCALE AS SHOWN	
L. L. R.	D. B. W.	F. J. K.	DATE 2/81	PAGE D-12

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

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